This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

The Branner Geological Library

LELAND·STANFORD·JVNIOR·VNIVERSITY

Proceedings

of the

Philosophical Society

of Glasgow.

PROCEEDINGS

OF THE

PHILOSOPHICAL SOCIETY

OF GLASGOW.

VOL. XXX.

1898-99.

EDITED BY ANGUS M'LEAN, B.Sc., C.E.

PUBLISHED FOR THE SOCIETY BY

JOHN SMITH AND SON,

19 RENFIELD STREET, GLASGOW.

1899.

212937

Vol.	IX. (No. 1), ...	Price 2s. 6d.
Do.	IX. (No. 2), ...	,, 3s. 6d.
Do.	X. (No. 1), ...	,, 3s. 6d.
Do.	X. (No. 2), ...	,, 3s. 9d.
Do.	XI. (No. 1), ...	,, 4s. 0d.
Do.	XI. (No. 2), ...	,, 4s. 6d.
Do.	XII., ...	,, 4s. 6d.
Do.	XIII. (No. 1), ...	,, 4s. 6d.
Do.	XIII. (No. 2), ...	,, 4s. 6d.
Do.	XIV., ...	,, 10s. 6d.
Do.	XV., ...	,, 10s. 6d.
Do.	XVI., ...	,, 10s. 6d.
Do.	XVII., ...	,, 10s. 6d.
Do.	XVIII., ...	,, 10s. 6d.
Do.	XIX., ...	,, 10s. 6d.
Do.	XX., ...	,, 10s. 6d.
Do.	XXI., ...	,, 10s. 6d.
Do.	XXII., ...	,, 10s. 6d.
Do.	XXIII., ...	,, 10s. 6d.
Do.	XXIV., ...	,, 10s. 6d.
Do.	XXV., ...	,, 10s. 6d.
Do.	XXVI., ...	,, 10s. 6d.
Do.	XXVII., ...	,, 10s. 6d.
Do.	XXVIII., ...	,, 10s. 6d.
Do.	XXIX., ...	,, 10s. 6d.
Do.	XXX., ...	,, 10s. 6d.

CONTENTS OF VOL. XXX.

PAGES

I.—Some Points on the Social Progress of Scotland in Recent Times. By Ebenezer Duncan, M.D., C.M., F.F.P.S.G., President of the Society, - - - - - - - 1-11

II.—A Simple and Inexpensive Method of localising with X-rays. By Wm. James Fleming, M.D., - - - 12-15

III.—Fires: their Causes and Prevention. By William Paterson, Chief Officer of Fire Brigade, Glasgow, - - - 16-29

IV.—Some Investigations into Palæolithic Remains in Scotland. By the Rev. Frederick Smith, Private Chaplain to Captain the Hon. Arthur Hay Drummond, Cromlix, 30-38

V.—The Scottish Vernacular as a Philological Study. By James Colville, D.Sc., President of the Philological Section, - - - - - - - - - - - 39-58

VI.—Imperial Grants considered as Adjustments of Taxation. By W. C. Smith, Sheriff of Ross and Cromarty and Sutherland, - - - - - - - - - - 59-74

VII.—On the Different Instabilities of Convex Bodies spinning in different directions on a Plane, first discovered in Celts. By Magnus Maclean, M.A., D.Sc., F.R.S.E., 75-82

VIII.—Better Houses for the Poor—Will they Pay? By John Mann, Jun., M.A., C.A., - - - - - - - - 83-124

IX.—Insanity in its Relations to Punishment for Crime. By Richard Brown, Professor of Mercantile Law, St. Mungo's College, Glasgow, - - - - - - - 125-139

X.—The Taxation of Land Values. By John A. Todd, B.L., Writer, Glasgow, Lecturer on Political Economy, - 140-155

XI.—The Workmen's Compensation Act (1897), as bearing on the Building Trade. By James A. Love Tindal, Writer, - - - - - - - - - - - 156-173

XII.—The Prospect in Chinese Trade and the Present Opportunity. By G. F. Scott Elliot, M.A., B.Sc., F.L.S., F.R.G.S., - - - - - - - - - - 174-191

XIII.—From the Baltic to the Caspian: A Voyage across Russia. By Sam. Mavor, F.R.G.S., - - - - - 192-222

XIV.—Commercial Education at Home and Abroad. By James Knight, M.A., B.Sc., F.C.S., F.G.S., F.E.I.S., Second Master, John Street Public School, Bridgeton; Head-Master elect, St. James' Public School, Calton, Glasgow, - - - - - - - - - - - 223-255

PAGES

XV.—Reasons for Rejecting Physico-Chemical Theories of the Origin of Life. By William Wallace, M.B., C.M., M.A., - - - - - - - - - - 256-266

XVI.—Report of a Conjoint Visit of the Geological and Philosophical Societies to the Dumbuck Crannog, 8th April, 1899. By John F. Campbell, - - - - - - 267-271

XVII.—Electric Discharges in Vacuo and the Rontgen Rays. By A. A. Campbell Swinton, - - - - - - 272-283

XVIII.—The Evolution of the Blast Furnace. By A. Humboldt Sexton, F.C.S., F.I.C., Professor of Metallurgy, Glasgow and West of Scotland Technical College, - 284-293

XIX.—A Smallpox Hospital Experience of the Protective Influence of Vaccination. By R. S. Thomson, M.D., B.Sc., Visiting Physician, City of Glasgow Smallpox Hospital, - - - - - - - - - - - 294-306

XX.—Abstract of Paper on "The Communication of Infection by Flies." By W. A. M'Lachlan, M.D., Dumbarton, 307

Report by John Mann, Treasurer, on the Position of the Trust constituted for the purpose of establishing the Graham Lecture and Medal Fund, 1st December, 1898, 308-311

Memorial Notice of the late Professor Joseph Coats, M.D. By T. K. Monro, M.D., - - - - - - 311-314

Rules governing the Competition for the Graham Medal, 314

Minutes of Session, 1898-99, - - - - - - - 315-335

Office-Bearers of the Society, - - - - - - - 336

Office-Bearers of Sections, - - - - - - 337, 338

Committees appointed by the Council, - - - - - 339

Additions to the Library, - - - - - - - - 340-346

Exchanges with other Societies, - - - - - - 346-353

List of Periodicals, - - - - - - - - - - 353-355

List of Members, - - - - - - - - - - 356-367

Index, - - - - - - - - - - - - - 368-371

PLATES.

PLATE		PAGE
I.	—Illustrating Rev. Frederick Smith's Paper, - - - - -	33
II.	—Illustrating Mr. Sam. Mavor's Paper, - - - - -	209
III.	—Illustrating Mr. John F. Campbell's Paper, - - - -	271
IV.	—Illustrating Mr. A. A. Campbell Swinton's Paper, - -	275
V.	—Illustrating Professor Sexton's Paper, - - - - -	289

PROCEEDINGS

OF THE

PHILOSOPHICAL SOCIETY OF GLASGOW.

NINETY-SIXTH SESSION.

PRESIDENT'S OPENING ADDRESS.

I.—*Some Points on the Social Progress of Scotland in Recent Times.* By EBENEZER DUNCAN, M.D., C.M., F.F.P.S.G., President of the Society.

[Read before the Society, 2nd November, 1898.]

IN a former address to this Society I endeavoured to sketch in rough outline the ethnological character of the Scottish people, and I submitted to you my reasons for holding the opinion that the Scottish people are more Teutonic than the English, and that the differences which characterise a typical Scotchman, and distinguish him from a typical Englishman, are due to the fact that, by blood, he inherits more fully the racial peculiarities of the Teuton. In that address I dwelt perhaps too exclusively on the good points which we inherited with our Teutonic blood, and now I wish to complete the picture by considering certain evil propensities which are known to be most prevalent among Teutonic nations, and which, therefore, have also come down to us from our Anglian and Norwegian ancestors, viz., drunkenness and sexual immorality.

I shall afterwards make some remarks on the allied subjects of pauperism and insanity.

DRUNKENNESS.

We shall first consider the facts with regard to alcoholic intemperance in Scotland. If it were asked which of the three parts of the United Kingdom is the most addicted to the vice of drunkenness, most people would say Scotland without hesitation. If, instead

of the year 1898, I had been speaking of Scotland a quarter of a century ago, the statement would have been correct. Most of the statistics on this subject which appear in the ordinary volumes of statistics and almanacs were compiled about that time, and, as far as I can make out from examination, have never been brought up to date. The following table, extracted from the well-known volume of Mulhall's Statistics, published in 1894, but probably collated many years before, gives the following figures :—

DEATHS FROM ALCOHOLIC EXCESS.

	Per 1,000 Deaths.	Per Million Inhabitants.
Sweden,	6·25	106
Scotland,	3·29	60
England,	2·04	40
France,	1·05	23

It has been noted that drunkenness is more common among the Northern Teutonic races than elsewhere. In support of this statement the above table shows that, of the countries named, Sweden, which is the most purely Teutonic nation in Europe, has the highest death-rate from intemperance. Scotland comes next, and in this respect again shows evidence of its Teutonic origin. France, which is largely Celtic, is the lowest in the list, and England stands midway between Scotland and France. In the 25 years which have elapsed since these figures were approximately correct and formed a fairly accurate view of the facts for comparative purposes, Scotland has improved its position in this respect. The place which Scotland then occupied is now filled by England, the people of which, at the present time, not only drink more per head, but also suffer more from alcoholic excess in diseases of the liver and in death from intemperance and *delirium tremens* than the people of Scotland. The table which I now show is compiled from the Inland Revenue Returns. It gives the actual amount of spirits consumed annually per head of the population at four periods in the three parts of the United Kingdom :—

Average over	England.	Scotland.	Ireland.	
1850-52,	·77	2·54	1·20	Gallons per head of the population.
1860-62,	·77	1·52	·73	
1870-72,	·92	1·97	1·14	
1890-92,	·92	1·87	1·09	
1898,	·92	1·78	1·0	

The three-year periods are taken because the census gives us an accurate account of the population of the middle year, and we are therefore able to make an accurate estimate. I have also given the returns for the year ending March 31st, 1898, because doubt has been expressed about the accuracy of the previous returns, but I am informed that the returns for last year may be relied upon as absolutely correct.

The figures show clearly that during the last 20 years the total amount of whisky consumed in Scotland per head of the population has been gradually diminishing, and, on the other hand, that the consumption of spirits in England has been increasing.

I may explain, with regard to the figures for 1890-92, that the foreign and colonial spirits were not given separately for the three kingdoms in the returns; but, finding that the total amount of these spirits consumed in the United Kingdom has not varied much in the past 30 years, I have based my calculation with regard to their consumpt on the average for the ten years ending 1884, during which the amount consumed in Scotland was separately given. It appears that England now consumes nearly as much per head per annum as Ireland. We must now consider the amount of beer consumed respectively in the three countries. According to the Inland Revenue Returns for 1898 the annual consumpt of beer in England was 34½ gallons; Scotland, 15½ gallons; Ireland, 22⅓ gallons per head of the population, and this amount has not varied much in recent years.

It thus appears that, at the present time, for every 4 pints of beer the Scotsman drinks, the Englishman drinks 9, and the Irishman 6; and, as regards spirits, the Scotsman drinks about 2 glasses of whisky to each glass consumed by the Englishman or Irishman; but, adding the beer and the whisky together, the Englishman drinks more alcohol than either the Scotchman or Irishman, in the following proportion of annual consumption per head of population:—

	Gallons of Proof Spirit.
England,	4·094
Scotland,	3·206
Ireland,	3·07

We now come to consider the effect of these changes on the health of England and Scotland respectively.

In the late Dr. Farr's Appendix to the Registrar-General's

Report for 1871, he refers to the fall in deaths from alcoholism and *delirium tremens* as being evidence of the decrease of the bad habit of drunkenness in England at that time. The following table shows the annual death-rate per million from these causes during the past 25 years, taking 5-year averages:—

Years.	1872-76.	1877-81.	1882-86.	1887-91.	1892-96.
England,	45	42·6	49	60	66
Scotland,	71	65	60	54	48

If Dr. Farr, who was a great authority on such matters, was right in his opinion, the above table proves that, whereas 25 years ago drunkenness was much more prevalent in Scotland than in England, now the position is reversed, and England occupies a bad pre-eminence in this respect. Dr. William Ogle, the present medical statistician to the Registrar-General of England, stated, in his supplement of 1885, that, in his opinion, the most trustworthy index of the prevalence of alcoholic excess was the ratio of deaths from diseases of the liver and ascites, and particularly deaths from cirrhosis of the liver, one of the commonest consequences of alcoholic excess.

On account of the increase in the mortality from these diseases during the ten years, 1871-80, as contrasted with the preceding ten years, 1861-70, he expressed the opinion that drunkenness was on the increase in England.

Let us now test Scotland, England, and Ireland by this standard:—

ANNUAL DEATH-RATE FROM DISEASES OF THE LIVER PER MILLION, 1881-90.

England,	328
Scotland,	257
Ireland,	246

Again, taking deaths from cirrhosis of the liver as a standard, the annual death-rate per million, 1882-86, was—

England,	120
Scotland,	52
Ireland,	44

It thus appears that, coincident with a diminution in the consumption of ardent spirits in Scotland, there was a gradual

decrease in the amount of disease and death consequent on the intemperate use of alcohol. On the other hand, in England, coincident with the increase in the consumption of whisky, there has been a striking increase in disease and death. The beer-drinking Englishman cannot indulge in Scotch whisky with impunity. The result of the attempt has been disastrous.

ILLEGITIMACY.

It has been noted by Liffingwell, who has made a special study of the subject, that, with few exceptions, the northern nations of Europe, of Scandinavian or Teutonic origin, apparently show the strongest proclivity to those anti-marital irregularities, of which illegitimacy is a sort of gauge. Let us contrast England and Scotland in this matter. The ten years, 1855-64, show (taking the total births in the country) an average of 9·1 per cent. of illegitimate births in Scotland, whereas in England, during the same period, the average of illegitimacy in the total births was only 6·4 per cent. I am glad to be able to say that, notwithstanding the growth of great cities, we are improving in this respect. The figures supplied in the Registrar-General's Annual Reports give the average of illegitimacy for the last three years as 7·2 per cent. for the whole of Scotland, and for the same period in England 4·2 per cent., so that in both countries there is a diminution in illegitimacy of about 2 per cent. of the total births annually. It is worthy of note that the improvement is greater in the towns than it is in the country districts; it does not follow, however, that sexual immorality is less in proportion, because in the cities prostitution, which adds little or nothing to the birth-rate, forms an outlet for sexual immorality there. The figures, however, are striking. Whereas in the chief towns in Scotland the percentage is only 7, and in the large town districts 6, in some of the counties the average reaches from 12 to 15 per cent. It is an interesting fact that it is generally in those towns and counties of Scotland in which the population is the most purely Teutonic that the highest averages occur. For instance, in Edinburgh the rate is 8·62 per cent., in Aberdeen 9·24 per cent., whereas in Glasgow, where the Celtic element is larger, the average sinks to 6·8 per cent., and in Greenock to 5 per cent. (These figures are from the last published report of the Registrar-

General for Scotland.) The north-eastern counties and southern counties, which are most Teutonic, have an average of from 11 to 12 per cent., whereas the north-western and south-western, which are more Celtic, average from 5 to 7 per cent.

The peculiarities of the Scottish Marriage Law, which permits of children born out of wedlock being legitimised by the subsequent marriage of their parents, and the conditions of the farm labourer and of the labouring population in the counties generally, making marriage difficult, are the main causes of the slow improvement which these figures demonstrate. It is satisfactory to find that, in spite of the adverse influences, there is an appreciable improvement in town and county alike.

Pauperism.

Pauperism, which is a frequent result of the vices of sexual immorality and drunkenness, has diminished rapidly in Scotland during the last 30 years. In 1698, when the population was only 1,000,000, Andrew Fletcher, in his second discourse on the state of Scotland, wrote as follows:—"There are at this day in Scotland, besides a great many poor families very meanly provided for by the church boxes, with others who, by living on bad food, fall into various diseases, two hundred thousand people begging from door to door; and though the number of them be perhaps double to what it was formerly, by reason of this great present distress, yet at all times there have been about 100,000 of these vagabonds who have lived without any regard or subjection either to the laws of the land or even to those of God and nature."

Taking the smallest estimate, in Fletcher's time, 100 out of every 1,000 of the people in Scotland were paupers, and sometimes the proportion was much greater.

Coming down to recent times, in 1868 the number of paupers was estimated at 40 per 1,000 of the estimated population, and a statement showing the remarkable diminution in these numbers at the present time is given in the Third Annual Report of the Local Government Board of Scotland, published this year, as follows:—"Since 1868 the ordinary poor have decreased from 130,441 to 87,221, a diminution from 40 per thousand to 21 per thousand of the estimated population"—that is, taking the increase of the population into account, there has been a relative decrease in the ordinary poor of nearly 48 per cent. in the last 30 years.

LUNACY.

A remarkable feature of the returns of pauperism is, that while there has been this great decrease in the ordinary paupers, the numbers of the lunatic paupers have risen during the same period from 5,790 to 12,282, an increase of 65 per cent. in 30 years. Taking the returns of private lunatics, the increase is not nearly so great. The average number of private lunatics during the five years 1866-70 was 36 per 100,000 of the population, and in the five years 1894-98 it had risen to 49 per 100,000. These figures raise the question, is lunacy in Scotland really increasing to such a serious extent? Do modern conditions of life necessarily lead to break-down of the brain and of its mental functions? This question was carefully considered by the Commissioners in Lunacy for Scotland in a Supplementary Report published in 1894, based upon the careful enquiries of Dr. Arthur Mitchell, Dr. Sibbald, and others. This report shows that the increase was not due to any augmentation in the rate of production of lunacy, but to a great variety of other causes.

As regards pauper lunatics, the most important of these causes, not of increased lunacy but of increased registration of lunatics, was the Lunacy Act of 1875, which placed upon Local Authorities the duty of providing accommodation for lunatic paupers, and also gave a large contribution from Imperial sources for their maintenance, amounting to one-half the cost. Out of this Act has grown the policy of building large palatial asylums in all parts of the country, so attractive and easy of access, that the numerous harmless imbeciles and lazy cranks who were a trouble to their relations, and formerly were allowed to wander about in every country village, were speedily gathered up in these institutions, and swelled the list of registered lunatics. That this is the real explanation of the increase is apparent from the following facts which have been fully dealt with in Dr. Sibbald's report of 1894:—

"1st. There is no marked increase in the number of lunatics and imbeciles in Scotland according to the census reports at three decennial periods, as shown by the following table:—

LUNATICS AND IMBECILES PER 100,000 POPULATION.

Census Reports.	
1871,	340
1881,	385
1891,	384

"2ndly. Dr. Sibbald proves that although there is an increase in the numbers of private lunatic patients in the asylums of Scotland, that increase is not due to any augmented rate of production, but entirely to accumulation. This is proven by the fact that the annual rate of admissions has not increased. It has remained nearly the same during the five years' periods from 1860 down to the present time.

"3rdly. Dr. Sibbald proves that this accumulation is not due to diminished death-rate in the asylums, because for thirty years the annual death-rate has not varied to any extent which would account for the increase in numbers."

Taking all the facts into consideration, the Scottish Commissioners in Lunacy say, in the report above referred to, that "there is no ground for a belief that insanity is to-day more prevalent in Scotland than it was thirty-six years ago."

A similar report on the alleged increase of lunacy in England was published last year. The inquiry was conducted on the same lines as that by the Scottish Commissioners, and the conclusion expressed in that report was as follows:—

"The returns then, if correct, or if equally incorrect, in the two successive decennia, so far from showing that lunacy, as measured by the proportion of new cases annually occurring in the population, is on the increase, show the contrary, and lead to the conclusion that there has been a slight decline."

There are optimists in lunacy who hold that, instead of having increased, it has greatly diminished in modern times. At a meeting of the Psychological Section of the British Medical Association held in Carlisle three years ago, the president of the section said that, in his opinion, there were good grounds for the statement that the average man is now less liable to insanity than he was thirty years ago to some degree not exceeding 30 per cent.; but that he is more liable to be sent to an asylum for reasons that would not have led to that result thirty years ago. We have thus three views of the matter—1st view, that insanity has increased owing to the greater competition and struggle in business of all kinds, to unwholesome physical conditions in our large cities, and to a supposed increase in vice and immorality in these crowded centres of life; 2nd view, that insanity has not increased; 3rd view, that it has diminished. My own opinion is that insanity has neither materially increased nor diminished within the last thirty years, and I found this opinion not only on the figures and arguments set

forth so ably by the Commissioners in Lunacy, but also on a consideration of the Returns of the Registrar-General, which show that the deaths from insanity itself, and from diseases associated with mental derangement, have not varied much in late years. England has shown the same gradual increase in registered lunatics during the last thirty years as Scotland, and yet, in a table which appears in the Returns of the Registrar-General for England, the diseases which are commonly associated with mental strain appear in that time to have diminished, and death from lunacy remains stationary in the last three quinquennial periods for which we have complete returns. I have, in the table which I now show you, compared these results with similar periods in the Scottish Returns:—

AVERAGE DEATH-RATE TO MILLION LIVING (ENGLAND).

	1881-85.	1886-90.	1891-95.
From Insanity and General Paralysis of Insane,	100·6	91·4	101·8
Softening of the Brain,	122	120	99
Hemiplegia (Brain Paralysis), -	369	319	276
Total, - -	591·6	530·4	476·8

AVERAGE DEATH-RATE TO MILLION LIVING (SCOTLAND).

	1886-90.	1891-95.
From Insanity and General Paralysis of Insane, - -	54	60
Softening of the Brain, - -	77·5	71
Hemiplegia (Brain Paralysis), - - -	395	368
Total, - - - -	526·5	499

Owing to differences in the nomenclature of these diseases in the Registrar's Reports for England and Scotland during the first half of the quinquennium 1881-5, I am unable to make any accurate comparison for that period. But the above figures show that in neither country is there any increase in the death-rate. Taken as a whole, they show a diminution.

SUICIDE.

Another standard by which we may measure the amount of mental unsoundness in the community is the death-rate from

suicide. The same problem of an apparent gradual increase during the last thirty years occurs here, as shown by the following table :—

SUICIDE RATES FOR THIRTY YEARS—1865 TO 1894.

Quinquennial Periods.	Average Annual Rates per Million of Population. England and Wales.	Scotland.
1865-69,	67	40
1870-74,	67	34
1875-79,	72	45
1880-84,	75	50
1885-89,	79	59
1890-94,	86	54
1865-94,	74	48

In an article by Dr. John Sibbald, Commissioner in Lunacy for Scotland, recently published in the *British Medical Journal*, he analyses the details of the different methods of suicide during the last thirty years, and shows that—

1st, when a method such as hanging is employed, in which there is no doubt about the suicidal intention, there is no increase either in England or in Scotland :—

SUICIDE BY HANGING FOR THIRTY YEARS—1865-94.

Periods.	Years.	Average Annual Rates per Million of Population. England and Wales.	Scotland.
Periods of 15 years,	1865-79,	25	16
,, ,, ,,	1880-94,	24	16
,, 5 ,,	1865-69,	26	18
,, ,, ,,	1870-74,	25	14
,, ,, ,,	1875-79,	26	17
,, ,, ,,	1880-84,	26	15
,, ,, ,,	1885-89,	25	16
,, ,, ,,	1890-94,	23	16

Dividing the thirty years into two periods, he shows that in England in the first period suicides by hanging amounted to an average of 25 per million of the population annually, and for the second period 24 per million. While in Scotland they amounted to 16 per million for each period.

2ndly, in the case of death by firearms, and by cutting and stabbing, in which there is frequently a doubt as to whether the case is suicidal or accidental, the same result is arrived at if you

treat the cases as a whole without reference to the disputable question whether they were suicidal or accidental. The rates are almost the same in both periods, 27½ per million in England and 18½ per million in Scotland.

3rdly, in deaths by poison and drowning, in which also the question of suicide or accident is frequently in dispute, the same result is obtained by treating the total number of deaths without reference to the disputable question. In England a fairly constant average of 138 per million, and in Scotland 182 per million in both periods of fifteen years. In conclusion, he states his opinion that the apparent increase of suicide shown by the figures in the first table may be accounted for by the registering of deaths in recent times as suicides which would in former times have been registered as accidents. He attributes the apparent increase in suicide to the fact that, in most countries, the belief that the act of suicide necessarily involves disgrace has greatly diminished since it has come to be regarded, in at least a large proportion of cases, as the result of mental disease. After a careful study of the facts, I am of opinion that Dr. Sibbald's view of the matter is well founded, and that no appreciable increase in suicide has taken place in Scotland in recent years.

Measuring, therefore, by the standard of suicide, which, in the great majority of cases, is due to mental unsoundness, I am again led to the belief that lunacy has not increased in Scotland during the past thirty years.

In conclusion, my object has been to put in statistical form the proofs of improvements in the social habits of the nation, which, I believe, are still in progress, and which are surely leading to the physical and moral elevation of the people of Scotland.

I think the facts which I have placed before you should encourage us to believe that the growth of great city communities may ultimately lead, not to deterioration of the race, but to a higher standard of physical life, and a nobler development of moral character.

II.—*A Simple and Inexpensive Method of Localising with X-rays.* By Wm. Jas. Fleming, M.D.

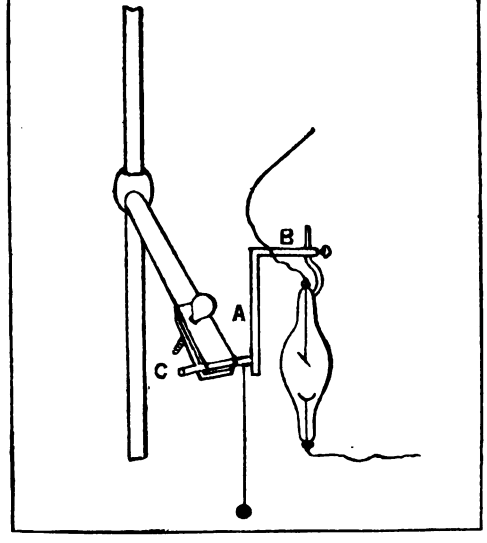
[Read before the Society, 2nd November, 1898.]

A number of workers have devised methods of localising buried objects which cast shadows with X-rays. Probably the best is Dr. Mackenzie Davidson's, and with it most accurate results can be obtained; but, like all the others which I have seen described, it is elaborate, cumbrous, and expensive. All the methods are based on the measurement of the distance apart at which two images are produced by rays impinging upon the object in two directions at known angles to each other. In trying to arrive at this by simply moving the focus tube in the ordinary holder to definite distances on each side of the perpendicular passing through the object, I found the great difficulty lay in the fact that the tube had to be rotated upon both its axes, in order to make the slanting surface of the anode face in the desired direction. When the tube is held in the usual manner, in a clamp, this requires so much measurement and adjustment that a large element of uncertainty is introduced. The small holder which I am about to describe overcomes this difficulty by enabling the tube to be rotated on two axes crossing at the centre of the anode, the point from which the rays proceed, and in this way avoiding any alteration of the distance of this point from the plane of the surface of the sensitive plate.

As may be seen from the diagram, Fig. 1, the holder consists of one vertical arm, *A*, and two horizontal arms, *B*, *C*, the horizontal arms coming off at right angles, at the ends and opposite sides of the vertical. The upper horizontal arm, *B*, is perforated near its extremity from above down by a hole large enough to take the neck of the tube, and is provided with a pinch screw

to fix it. The other horizontal arm, *C*, consists of a short piece of small brass tube, open at both ends, passed through the vertical bar, *A*, and firmly fixed in it. This brass tube is held in the jaws of an ordinary wooden tube stand.

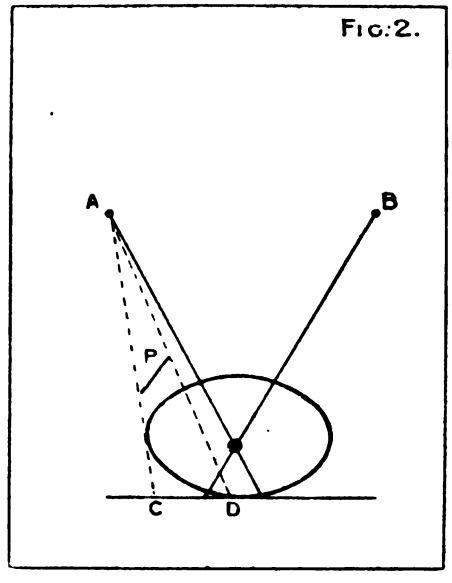
FIG. 1.



A plumb line is dropped from the brass tube.

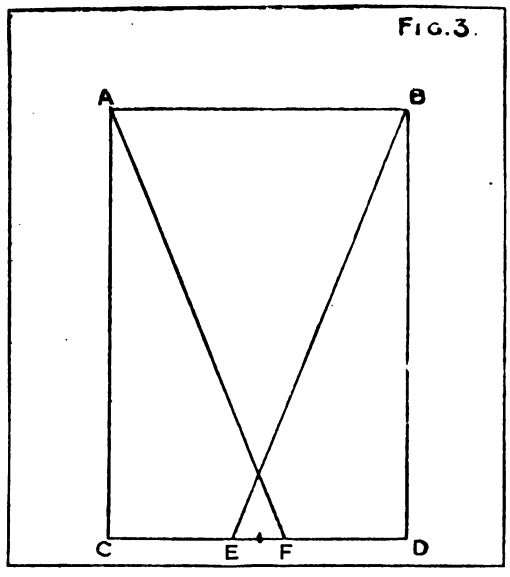
With this simple appliance [made for me by Messrs. Baird & Tatlock, Glasgow,] sufficiently accurate results may be got. The method of employing it is as follows:—The neck of the tube to be used is passed through the hole in the long arm, *B*, and adjusted so that, on looking through the brass tube, *C*, the centre of the anode is found to be opposite the centre of the brass tube. The neck is then fixed by the pinch screw, and its exact position may be marked upon the stem with ink or a morsel of gummed paper. The brass tube is now clamped in the jaws of the holder, care being taken that it is horizontal. The plumb line is adjusted to the distance at which it is proposed to place the anode from the plate during the exposure, and this distance is carefully noted. The vertical position of the object having been previously approximately ascertained by the screen, or by means of one or more photographs with an opaque object placed in known position on the surface, the tube is adjusted at whatever distance may be judged

best from this vertical position, and by rotating the tube in the hole in the upper arm, and then rotating the tube and holder in the jaws of the stand, the surface of the anode can be faced in the desired direction, without other alteration of its position. The point immediately below the plummet is now carefully marked on a sheet of paper laid below the photographic plate, and extending considerably beyond it. Upon this has previously been marked a line outside the plate, which, if prolonged, would pass directly under the object. After the first exposure is made, the tube is moved by lifting the stand until the plummet falls at the same distance on the other side of this central line. This position is also marked on the paper. The anode is adjusted, and a second exposure made. Care must be taken that the positions of the horizontal arm of the stand at the times of exposure are parallel to each other. With a little practice it is now possible to place a flat piece of metal in such a position that the portion of the plate to receive the one exposure is protected from the rays during the other. This may be seen from Fig. 2. When the



anode is in the position *A*, the surface between the dotted lines *C D* is protected by the plate *P*, and upon this portion of the sensitive film will fall the image when the anode is placed at *B*.

The metal plate, being adjusted on the other side, protects the image already made during the second exposure from *B*. After the plate is developed, a sheet of paper is taken. Upon it is drawn a parallelogram, of which the sides, *AC*, *BD*, are exactly



the length of the plumb line—that is to say, the distance of the anode from the sensitive plate — and the top and bottom, *AB*, *CD*, the length through which the tube was moved, as recorded by the marks showing the position of the plummet. The distance of the two images from each other is carefully measured and marked on the centre of the base line, *E* and *F*, and a line drawn to each of these points from the opposite angle of the parallelogram. The point where the two diagonals intersect is at the same distance from the line, *CD*, as the object was from the sensitive film.

III.—*Fires: their Causes and Prevention.* By William Paterson, Chief Officer of Fire Brigade, Glasgow.

[Read before the Architectural Section, 12th December, 1898.]

It is at all times a risky proceeding for an outsider to attempt the instruction of those who have had a special training, besides opportunities of acquiring information and experience, with respect to a given subject. I feel no difficulty in connection with the first part of my present subject, viz., "Fires: their Causes." The ascertained causes are facts that admit of no dispute. How the remedies are to be applied is a subject upon which there is considerable room for difference of opinion, and while I shall not attempt to dogmatise in the opinions or theories I hold, I am sure that my views will receive such kindly consideration as I have always experienced from the individual members of the community to which you belong.

In dealing with the causes of fires it may be well to point out that they are not so varied nor so numerous as one would be disposed to imagine. During the fourteen years I have occupied my present position in the Glasgow Fire Brigade, the separate and distinct causes of fires, so far as they could be ascertained, did not exceed fifty in number; and I am convinced, from observation and experience, that even this number would have been considerably lessened if the one word "carelessness" had formed a column heading, and had its deserts fully and faithfully recorded. Indeed, I may go further, without fear of contradiction, and say broadly that the great majority of the fires, alike in this city and elsewhere, are due to carelessness in one form or another. Carelessness, however, is not one of the causes recorded by fire brigades, though, as we proceed to consider the subject, it will be apparent that the responsibility is by no means a trifling one.

It may be well that I should give you in nearly alphabetical order the various causes of fires, without entering into the numbers due to each cause.

"Acid leaking" is occasionally responsible for an outbreak of fire in the chemical work, or store, and in factories or workshops where acid is in use, or on board ships, or elsewhere in transit.

"Burning shavings" by the joiner, or "Burning rubbish," regarded by many as the readiest means of getting quit of objectionable matter, has at times results much more serious than anticipated; for a high wind has been known to carry cinders or sparks into adjoining workshops, which, being generally of a very inflammable nature, alike as to construction and contents, readily fall a prey to the flames.

The necessary operation of "Burning corkwood," preparatory to its further manipulation, sometimes necessitates the calling out of the brigade.

"Candles," including tapers, are responsible for a few fires in the course of the year, mostly through coming into contact with drapery in bed-rooms.

"Children playing with lights" occasion quite a number of fires, the majority of these being in dwelling-houses; and many times have I seen the little things terribly burned through the ignition of their own clothing or bedding material. In this connection I may mention that there is, in this city, one little fellow, not over four or five years of age, who has such a propensity for "kindling wee fires" that the brigade has twice been called to his mother's house, where considerable damage was done.

"Defective gas-fittings" result in a few fires, and movable gas-brackets at times get into contact with window or other curtains. I have even known gas jets to be left burning, and somehow or other find their way under shelving stocked largely with empty boxes.

"Defective electric-light installations" also contribute their quota; but good materials, reliable workmanship, and careful inspection should make fires from this cause of very rare occurrence.

"Defective building construction" in some shape or form is by far the greatest offender as regards the origin of fires in our city, and compared with the cities of London, Liverpool, and Manchester, I am sorry it has to be confessed that we bear a most unenviable reputation. From a return partly made up by the late Mr. Goodchild (a gentleman who was well known to many present), and which I have brought up to December, 1897—a return covering a period of twenty-three years—London, it appears,

had 6·7 per cent.; Liverpool and suburbs, 12·5 per cent.; Manchester, 18·4 per cent.; and Glasgow 31·6 per cent. This is a reproach to our city, but, happily, one from which we are recovering, for the percentage of fires from such causes is gradually becoming smaller. It goes to prove that the careless or jerry builder is not altogether a being of to-day, but that he has flourished with the growth of the city in past ages. An incident, showing the difficulties of the inspector in dealing with the scamp workman, occurred in connection with the erection of a block of tenement property in the northern portion of the extended city. The inspector discovered a joist running into a vent, and on pointing out the absence of a protecting fire-clay shod to the joiner, the latter immediately produced one, and subsequently boasted that his outlay for shods had not been heavy, as a single shod judiciously moved from place to place had been quite sufficient to meet the requirements of the whole job. I will not in the meantime further refer to fires caused by building defects, but at a later stage I will have something to say upon this subject.

"Dust in contact with artificial light" is a well-known, though not very frequent, cause of fires. Fine particles of vegetable matter, with a certain admixture of air, become highly inflammable and explosive. I have seen the fine dust accumulated in a wood-turner's workshop produce quite a violent explosion when disturbed by the fireman's jet of water and, in its powdery form, thrown into contact with a portion of the fire not yet extinguished.

"Escapes and explosions of gas" contribute not a little to the work of fire departments, and in their results both life and property suffer seriously. Ordinary caution would save much damage being done from this cause, if people would only open doors and windows when the smell of gas is detected, and not go in search of the escape with a lighted candle or lamp.

Fires due to "Explosions of boilers," though not unknown, are happily not of frequent occurrence. Perhaps the greatest offender in this direction is the ordinary or domestic kitchen boiler, and, since it is ever present in our homes, it is comforting to know that its reputation is by no means a bad one. However, the result of one such explosion in the city did come under my observation, and the explosion was so violent that it blew up the floor of the room overhead and scattered the burning coal to such an extent that the ignition of the house resulted, considerable loss being sustained.

In the City of Glasgow, where manufacturing of all kinds is carried on to such an extent, it need not be a source of surprise that an occasional fire arises from "Friction of machinery." These fires occur in textile factories and in engineering and other works, and are largely due to insufficient lubrication of journals, or to the use of an inferior quality of lubricant.

It is not to be wondered at that in our city many fires spring from "Heat from boilers," the tops of which are frequently used for drying light and inflammable materials. "Heat from flues" originally constructed for dwelling-house fires but now transformed into restaurant kitchen vents," "Heat from badly constructed and imperfectly isolated furnaces," and "Heat from steam pipes" around which the dust of ages has been allowed to accumulate: these are causes which, generally speaking, when pointed out before the occurrence of a fire, are given but little heed to, and one is met by a look of incredulity, and informed that this stove, or furnace, or steam pipe, has been in use for 20 years without a fire resulting. I recall one instance where the dangerous position of a gas stove on a work-bench was pointed out to a foreman, who could not, or would not, see the risk he was running, and who scouted the idea of any alteration being necessary. Nemesis, however, soon overtook him, for the brigade was at the self-same workshop within 36 hours; a good-sized hole was burned in the bench, and the gas-stove had dropped to the floor, where it was allowed to lie until the foreman arrived and viewed with speechless wonder "what might have been."

A fairly frequent cause of fires is "Hot ashes." These, drawn from furnaces or boiler grates in factories, are thoughtlessly laid in close proximity to some description of wood-work, and, given suitable weather conditions, they are soon fanned into a red-hot mass, and more or less destruction of property follows. Again, on shipboard, in harbour, ashes are at times laid down against iron bulkheads, the hands in the stokehole being ignorant or forgetful of the fact that the iron bulkhead is often wood-lined and deafened with sawdust in the adjoining compartment. The housewife, too, is often a sufferer, for, after disposing of the ashes, by placing them in a bucket in the bunker, she goes out, returning to find her house wrecked, and the savings of years, in the form of household goods, if not wholly consumed, at least badly damaged.

Under the heading of "Hot metal" a few fires fall to be recorded from time to time. This term includes hot rivets in

boiler-sheds or shipbuilding yards; molten metal, scattered by the bursting of moulds in iron or brass foundries, or the bursting of cupolas in glass works; cuttings flying in the forge; or the tailor's overheated goose left on his board at the conclusion of his day's work.

The necessary operation of "Fumigating" contributes an occasional fire, when it is sought to rid the premises of the microbe or of the vermin to be found in dirty houses.

"Incendiarism" plays a part, though I am pleased to say not an important one, in the production of fires. What leads to this happy result I am not quite prepared to say. The difficulty of obtaining a conviction for fire-raising is great, but perhaps those who would try it fear the still greater difficulty of imposing on the up-to-date fire insurance assessor.

"Intoxication" is also a contributor to our list of causes, but in this our reputation is quite as good as that of our neighbours across the border, despite the name we have for the consumption of home-manufactured liquors.

"Lamps" are responsible for quite a number of fires. Carelessly used in public works they add to the losses by fire, while in dwelling-houses the upsetting of the paraffin lamp at times results in serious injury to the person or even in death. The most disastrous fire on record, such as it is hoped the world may not see again, was caused by a lamp kicked over by Mrs. O'Leary's cow, in Chicago, on a Sunday night in October, 1871.

"Lightning" at times results in the ignition of buildings, although in some cases masonry only is affected by the stroke, as when the spire of St. Enoch's Parish Church was struck a few years ago. The net-work of telephone and telegraph wires overhanging the city undoubtedly adds to our safety through carrying the fluid harmlessly to earth. But in the outskirts damage from this source is more frequent, and probably no district in the vicinity of the city has suffered more than Cathcart. Perhaps the most noteworthy case that ever came under my observation was that of a distillery, where one flash struck a telephone wire and the iron stays of an elevator, starting four separate fires. The fires were trifling, it is true, but their number was sufficient to occasion surprise.

"Lights or matches dropped" cause a large proportion of the fires in this city as in others. Hardly one description of place more than another escapes, though naturally by far the greater

number of these fires occur in dwelling-houses, where the occupants leave a spark behind when searching for some needed article of wearing apparel in dark press wardrobes and such places.

"Lime slaking" causes an occasional fire, but this is not a frequent source, nor are fires from this cause likely to occur in positions involving much risk to property.

"Oils, fat, tar, &c., boiling over," while not productive of many fires, are nevertheless a source of danger, and in Glasgow fires so caused have frequently had serious results in the destruction of property and in loss of life. Varnish making has on more than one occasion had fatal results, when the heated compound boiled over, and, igniting, instantly enveloped the operatives in flames. Home making of furniture polish is another source of danger, and would be better avoided unless the maker has a recipe for a polish that can be made up without boiling. A few years ago quite an epidemic of fires occurred in the fried fish and potato shops from the boiling over of their cooking materials, but recently there has been a falling off in the number.

"Plumbers and gasfitters at work" are, through their operations, an occasional source of danger, although the risks from this cause are considerably diminished since the old-fashioned choffer was cast aside.

"Reflected solar rays" have caused a fire in our city. This really took place in a drapery establishment on the South-Side on a glorious summer Sunday, and, I think, should be treasured as a pleasurable incident when jokes are made at our bad climatic conditions.

The family of sparks now comes in for consideration, and it is quite a numerous one.

"Sparks falling down chimneys" ignite the accumulated soot behind disused and boarded-in fireplaces, and as these frequently have shelves filled with inflammable goods erected in front of them, it may easily be seen that the resulting loss is at times considerable.

"Sparks from chimneys" also result in an occasional fire, and this happens principally in the dry season, when the dust gathered on roofs and gutters is in a condition to be set alight readily. The balmy breeze fans the smouldering mass into a flame, and the roof is blazing ere anything wrong is suspected. The high winds carry fine particles from the streets; soot falls from neighbouring chimneys, and through time is drifted by eddies into protected corners. By-and-by, the live spark follows and the mischief is

done. At no time is the fireman so anxious as at an extensive fire after a long continuance of dry weather, for the flying sparks may, and at times do, alight on a congenial soil that does not exist when roofs are saturated with rain or covered with snow.

"Sparks from fires," including live coals falling from grates or stoves, cause quite a number of fires. These occur mostly in dwelling-houses, although there is no description of premises which can be said to enjoy immunity from such risk.

The muslin gas-singeing machine emits an occasional spark which, reaching the cadis inseparable from buildings used for such operations, has no difficulty in getting in its deadly work.

"Sparks from locomotives" are well known to cause fires, although this is generally disputed by the railway company when responsibility for damage is attempted to be placed upon it; but stations in Glasgow have been damaged where the fire was distinctly traceable to locomotive sparks, and even the most unobservant traveller cannot fail to have seen the blackened patches on the verdure bordering the railway track.

"Spontaneous ignition" is held accountable for an occasional outbreak, rag stores being, perhaps, the principal sufferers. Some years ago, however, a fire in this city was attributed to the spontaneous ignition of some artificial fire-lighters. The owner was so incredulous that the fire had been caused in the manner suggested, that he parcelled up a few of the fire-lighters and sent them to an analytical chemist. The chemist was overwhelmed with work at the moment, and laid the parcel on his desk to be dealt with at a later time. That time did not arrive, for the fire-lighters started operations on their own account, and were consumed where they lay. A recent instance was the spontaneous ignition of a bag of gum in a large factory in the city. This had been stored away in the month of August, and ignited, smouldering away unnoticed for two months, when the fire broke out. On examination, the offending bag was discovered with its contents almost wholly converted into a hard calcined mass, resembling slag.

"Thieves or burglars at work" is a recognised, though not a common, cause of outbreak. I suppose their deeds are more likely to have a satisfactory result if performed in darkness. It was only recently that some safe-breakers caused a fire in a factory in the city, and they were compelled to beat a hasty retreat without securing anything of value.

"Tobacco smoking" results in the destruction of a little property at times, but it is as nothing when the extent of the habit is considered.

"Vapour in contact with lights" causes an occasional fire in distilleries, oil and resin works, and such places, where volatile goods are handled. The naphtha cask in the shipyard or boiler-shop, when lamps are being filled, also comes under this head, and in all the flash is so quick that personal injury frequently takes place. It is an undoubted fact that the empty barrel is often the more dangerous. While really empty so far as liquid is concerned, it may be nevertheless full of vapour evolved from the saturated wood, and is at times in a most explosive and dangerous state if approached with a naked light.

"Window blinds, or curtains, or goods," getting into contact with lights, cause quite a number of fires. These are largely confined to dwelling-houses, where an open window causes the curtain to be blown against an unprotected gas-jet. Falling blinds, or the articles in a draper's window, sometimes meet a similar fate.

The origin of a large percentage of fires here, as well as elsewhere, necessarily falls to be recorded as "Unknown." These are such fires as may arise from any one of many causes, though the exact one is not apparent. What is felt by all interested in such matters is the absolute ignorance as to the origin of nearly all large fires, where every trace of their commencement has been destroyed, and there is not even room for conjecture, much less for the hope that the knowledge gained would result in future benefit.

I have now to deal with the second and most important part of my subject. The prevention of fire has, I am glad to observe, received much greater attention during the past ten years than it has at any previous period in the history of this country. This change has been in a great measure brought about by the practical, painful, and expensive lessons taught by extensive fires in our large cities and towns, and the wholesale destruction of historic residences and of public institutions in almost all parts of the country.

It is necessary here that I should give a definition of what I consider "fire prevention" to mean. It may be asked "what has a member of a fire brigade to do with the prevention of fire? His duty is to extinguish a fire when it occurs." This is so far correct;

but if in the performance of that duty he has acquired a knowledge of the causes of fires, then he fails in his duty to the community if he does not point out both the seen and the hidden dangers, and indicate what he believes to be the best and most practical remedies. "Fire prevention" I take to mean the adoption of all possible precautions to prevent an outbreak of fire. I desire to draw a distinct line between "fire prevention" and "fire protection." I have already given a definition of the former. The latter is a much wider subject, and includes fire brigades; the size, height, and character of buildings; the storing of highly inflammable materials; manufacturing processes in large buildings; and congested areas. I will have something to say on fire protection before the close of the paper, and will now consider fire prevention.

During the past few weeks we have been frequently called upon to extinguish fires, mostly in dwelling-houses, caused by building defects. These mainly consist of defective vents, defective fireplaces, and timber under hearths. Defective vents alone have caused 368 fires during the past two years, or 29·4 per cent. of all the fires in the city during that period. A defective vent we take to mean one in which a joist, safe-lintel, browband, or rafter, is built into a chimney. We include, also, the dook that the joiner has driven into the chimney when he wishes to secure a lath strap or skirting ground. Some builders, and even architects, have great faith in fire-clay or metal shods as a prevention against fire when placed on the end of the obtrusive joist or beam. I have no hesitation in declaring all such devices to be absolutely unsafe and unreliable. The only safe method is to keep all wood-work at least 9 inches clear of the chimney, and to substitute iron for wood safe-lintels where the end of the lintel comes too near to the chimney. Timber under hearths still causes about 7 per cent. of our fires. These defects have been prohibited by the Building Regulations, and under proper supervision should not occur in properties erected under that Act. It is interesting to note that the only fire from one of these causes, in a property erected since the passing of the Building Regulations, took place in a property belonging to the Corporation.

I fancy I hear some say, "the defects referred to are small matters." My answer is, they are; but they are important enough to cause serious fires, and entail much hardship to the unfortunate tenant who has been victimised by the jerry builder.

While these fires most frequently occur in dwelling-houses, the

small percentage of the occupiers of houses under, say, £15 rent, who insure their furniture, is very striking, and many cases come under my notice wherein the plenishing of a workman's house, which had taken him years of saving, was completely destroyed. In these days of Compensation Acts and others of a similar character, it may be worthy of consideration whether the owner of a building in which a fire occurs from latent defects should not be liable for any damage which a tenant may sustain. In the case of large and serious fires it is seldom that we are able to arrive at even a probable cause, but I am quite entitled to assume that at least one-third of such arise from building defects, keeping in view the results of the ascertained causes.

Much skill and money have recently been expended in the laudable effort to erect buildings which are described as fire-proof. I will not attempt to criticise the various methods which have been tried. Even where they have been most successful, the buildings are only proof against fire when they are entirely empty. Many of them contain sufficient goods of such an inflammable character, that, should one of the floors get well alight, the almost certain collapse of the structure would follow. This result is due to the insufficient protection of the rolled steel or iron beams, and their expansion by heat forcing out the outer walls. The most that can be claimed for buildings of this description is that they burn more slowly than those constructed in the usual way, and give firemen more time to protect adjoining buildings; but that they are an absolute preventative against fire, very few with a knowledge of building construction will claim, and no firemen of experience will admit. Last week a so-called fire-proof building in New-York was set on fire by an adjoining building which it completely overshadowed. The fire-proof building was fifteen storeys in height, and the other an ordinary and much lower building; the result was the burning out of the eight upper floors of the high building, a striking confirmation of my opinion that buildings can only be designated fire-proof so long as they are empty. I at once acknowledge that in the so-called fire-proof building the danger of fire occurring from any one of the building defects I have noticed is reduced to a minimum, but, while these defects are practically remedied in all buildings of recent construction, and the causes of many fires removed, I am not yet prepared to advise the Corporation to dispense with the services of the members of the fire brigade and sell off the plant.

In these remarks I have confined myself almost entirely to causes of fires which members of the architectural profession can, and, I have no doubt, will, help to remove.

I now turn to the wider question of fire protection. In a community like Glasgow this is a matter of vital importance. I do not desire to create any undue panic or alarm in regard to the existing condition of a large portion of the congested central areas of the city. The position of some of these areas is such that we have scarcely a yard of fighting ground left. The streets are so narrow and the buildings of such a height that it is often impossible either to secure positions, or to maintain them in the streets, after a building has become involved. The anxiety which all the officers of the brigade experience when called to these areas is great, and when a fire occurs in them which is confined to reasonable limits, we feel grateful that the evil day has been postponed. No man can say where a fire started under favourable conditions in some of these areas can be checked. From 1855 to 1894 the London Building Act limited all buildings of the warehouse class to 216,000 cubic feet. In 1894 the size was increased to 250,000 cubic feet. Up till now there has been no limitation as to size in Glasgow. The result of this I take from the evidence of Mr. James Thomson, architect, of this city, given before a Committee of the House of Lords on the Building Regulations Act in 1892:—

One warehouse contains - - - - -	1,685,000	cubic feet.
Another contains - - - - - -	1,557,881	,,
Do. - - - - - -	1,213,788	,,
Do. - - - - - -	7,698,156	,,

There is a warehouse larger than any of these, which Mr. Thomson named, but these are in all conscience large enough. The effect of this unlimited size in one risk is that no fire brigade can hope to limit a fire in one of these buildings to the building in which the fire has broken out, and it thus becomes a danger, not only to the adjoining buildings, but, under unfavourable weather conditions, to the whole commercial life of the city. It may be said that I am putting this matter too strong. Accept my assurance that it is no stronger than I feel on the subject, and I have spent many an anxious night when there was a gale of wind blowing, in dread of the possibilities which might occur should a fire break out in any of those dangerous areas or blocks. Any precautions taken with buildings in Glasgow

against the spread of fire in the warehouse districts are entirely due to the selfish interest of the owner and occupier as affected by the insurance rates. No consideration has been given as to how far one building may endanger all others within the same area. I do not hope for any improvement in this direction until our public authorities realise that they have a duty to discharge to the community, not only in providing the means of extinguishing fires, but also in reducing to a much lower minimum the probabilities of disastrous fires.

Much has often been written and said about the great proficiency of the fire brigades in American cities. I do not desire to say a single word against our American cousins, but I wish to point out that a few years ago I looked into the matter of cost, and found that, while in London the upkeep of the fire brigade amounted to 6½d. per head of the population, Glasgow spent 4¾d.; while New York and Chicago spent 4s. per head, or nearly ten times as much as Glasgow expends per head of the population. It is often found that we are too small in numbers when we have a serious fire in hand, or perhaps two or three simultaneous fires in different parts of the city. I wish, however, to state, to the credit of the Corporation, that during the last fourteen years they have been generous to the Fire Department, and have done much to place it on a satisfactory footing.

After the disastrous fire in East Howard and Dunlop Streets this year, it was rather interesting and instructive to notice how well the cast-iron lintels and columns had stood the intense heat. So far as I am aware there was not a broken cast-iron lintel in the whole of the buildings destroyed. This is more remarkable in view of the fact that three-fourths of all the lintels in the area were cast iron. Where rolled iron or steel had been used as lintels they twisted and sagged to such an extent that the walls had in all cases to be taken down. The cast-iron columns also behaved well. I only came across one broken, and there is no doubt that many of the columns and lintels had been struck by a jet of water when at a white heat.

The height of buildings and the nature of their contents are questions of great importance in regard to fire extinction. In Glasgow we are drifting slowly but surely in the wake of America. Rumours are in the air of ten and fourteen storey buildings about to be erected, and their contemplation is not a pleasing prospect to firemen.

The number of large mansions in all parts of the country destroyed within, say, the last 15 years, has been very great. In many cases every possible precaution had been taken to provide every comfort and convenience that modern science could suggest, still the great majority of these mansions had not a single fire cock, or a reliable length of hose, to deal with a fire even in its most rudimentary stage. This neglect is unpardonable, and I am not disposed to relieve the architectural profession from its due share of responsibility in the matter. In too many cases, even in our more modern mansions, the responsible advisers of the owners have been satisfied with a ¾- or 1- inch water supply for domestic purposes—the possible, and, in many cases, probable contingency of a fire being left wholly unprovided for.

The formation of the British Fire Prevention Committee is an illustration of the growth of public opinion in the right direction. Already the committee has accomplished good and useful work by the publication of reliable information on this important subject.

The tendency of legislation during the past few years has been to make, as far as possible, the lives of the British public more secure in places of worship and amusement. The Factory and Workshop Act, 1891, imposes on the Local Authority the duty of seeing that in all factories situated above the ground floor, sufficient means of exit is provided for all workers. Already this provision has wrought a great change in many factories, and new factories cannot be erected, or, at least, cannot start work, until a certificate has been obtained that the exits are sufficient. No new theatre or music hall, to accommodate more than 1,000 persons, can be built unless it is at least on three sides 15 feet clear from the nearest building, and unless the principal floor of the auditorium is not more than 3 feet above the level of the street.

The provisions of the Building Regulations Act, 1892, in reference to public buildings, are of a very humane and necessary character. No one at all acquainted with our public buildings will say that they are all absolutely safe for an assembled audience; in point of fact, in some of them I very much prefer to occupy a seat near to the exit. I have no doubt that before long the buildings deficient in this respect will be improved. As places of worship come within the designation of public buildings, there is now no reason why the insufficient means of exit in many of our churches should not be very much improved.

We hear it often stated that the auditorium of certain places of

amusement can be emptied in less than three minutes. This is quite correct. But the audience does not get clear of the building in three minutes. They are in the corridors and staircases, and it is a fact that the great loss of human life, which has taken place in cases of panic, has been almost entirely in the stairs and passages. A terrible instance was that of the Brooklyn theatre in the seventies, and more recent, though fortunately less serious, instances, have occurred in some of our home cities.

The magistrates of the city have taken the precaution of ordering that at least one fireman shall be present during all performances in our large theatres and music halls. This is undoubtedly in the public interest. The fireman is not responsible to, nor controlled by, the theatre or music hall management; in fact, he is rather a check upon it, and any neglect or defect in the appliances he has to report to the Fire Department.

Much has been done in factories and warehouses in recent years in the matter of fire protection, and many fires have been stopped by private appliances in their initial stages, which probably would have developed into serious fires before the arrival of the fire brigade. While I frankly acknowledge this, I wish, on the other hand, to point out a danger from the use of private fire appliances. The factory or warehouse brigade have been successful in extinguishing quite a number of fires without the help of the public brigade, and are proud of the fact. But a fire occurs which they tackle with their wonted vigour, only to discover after 10 or 15 minutes' work that the fire is gaining on them; then the public brigade is thought of and sent for. It, of course, arrives late, and is credited with allowing the place to be burned down, which the works brigade had so often saved. I desire to encourage all in the work of fire protection, but it is a mistake on the part of private fire brigades to omit calling the public brigade until the fire has obtained the upper hand.

In conclusion, the architects of the city can render valuable and much needed service in reducing the probabilities of large fires in the central areas by insisting on divisions by party walls into smaller risks; the erection of screen or fire walls; and the limitation and protection of communicating wells, which too often act as a means of igniting three or four adjacent buildings at an early stage of a fire. If this paper should be the means of causing more attention to be given to the means of reducing the loss by fire in the country, my object will be attained.

IV.—*Some Investigations into Palæolithic Remains in Scotland.*

By the Rev. FREDERICK SMITH, Private Chaplain to Captain the Hon. Arthur Hay Drummond, Cromlix.

[Read before the Society, 30th November, 1898.]

THE common forms of primitive, or palæolithic, fabricated flint weapons and implements are sufficiently well known to need no description here. But, for the sake of clearness, two of the most familiar forms are shown in Plate I.

The investigations of M. de Perthes in the Somme Valley, about the middle of the century, followed at a later date by the work of Sir Joseph Prestwich, Sir John Evans, Sir Charles Lyell, Sir John Lubbock, and others, established beyond doubt that man had existed in France, England, and elsewhere in Northern Europe at a very early age. Similar investigations in Scotland have hitherto not disclosed evidence of his existence in North Britain at the same early age, and, as explanation of the want of success that has attended repeated search, it has been variously advanced (1) that man was dammed out of Scotland by ice during the palæolithic age, and (2) that during that same period the country was submerged.

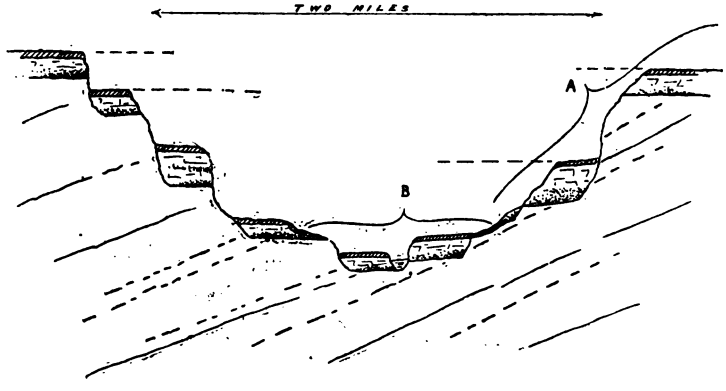
Neither of these explanations seems to be adequate; for (1) during part at least of the period in question (as during the deposition of the *Cyrena fluminalis* beds) the climate of Britain was warmer than it is now, and (2) the geographical occurrence of palæolithic remains in England and France evidence the period to have been that of the *great upheaval* and the denudation of the valleys in which these remains are now found. There can hardly have been so marked an upheaval in England and submergence in Scotland at one and the same time.

A more sufficient explanation is required, and is, I think, to be found in the suggestion that the searchers were looking for the wrong thing. The accepted forms being of flint, flint specimens were sought in Scotland; or, on the supposition that other material than flint might have been used, specimens of equally fine form and elaboration were expected. But no flint exists *in*

situ in Scotland; hence flint specimens should not have been anticipated. Moreover, no material save flint would accept the work which distinguishes the typical forms; and few Scottish rocks would have retained such work as the flint if it could have accepted it. Accordingly, neither flints nor as highly elaborated specimens of any kind can be expected in Scotland. It must, therefore, be assumed either that (1) palæolithic man was limited in his habitat to the geographical occurrence of flint, or that (2) such specimens as might exist in Scotland would be fashioned of the rocks native to the country, and would be lacking in the peculiar characteristics of flaked flint.

The first assumption has seemed to me to be entirely erroneous, and the second extremely worthy of acceptance. I have, indeed, thought it so worthy of acceptance as to have devoted a great many years to the investigation of its accuracy, with results much more conclusive than I had at first reason to expect.

Circumstances led me many years ago to be deeply interested in the whole question of palæolithic man, and to devote much time to the matter, working principally in East Anglia. When at a later date (1872) I came to Scotland, I resolved to continue in the same line of investigation. I began the search in the lower end of the Earn Valley. But the district was new to me; and, though I lighted upon certain stones whose peculiar shapes attracted my attention, I did not at that time get beyond tentative effort, and, for certain reasons, desisted from further serious attempts for some ten years. In 1883, however, I paid a visit to the Somme Valley, for the purpose of putting to test certain views



SECTION OF SOMME VALLEY.

which I had conceived in Scotland regarding the formation and distribution of river deposits. In the course of this work, which lasted for three months, I was led to further investigate the question of palæolithic remains.

During these investigations in the Somme Valley it became apparent that the contents of the soils were as characteristically evidential of its occupation by palæolithic man as the contents of the implement-bearing gravels. The soils of the higher plateaux and higher shelves on the valley's sides yielded stones in a perfectly angular and presumably fabricated condition in greater abundance than the lower. Indeed, the soils of the lowermost terraces of all contained none of these stones. The results may be tabulated as follows :—

(1) The geological and geographical occurrence of these stones show that a human agency must have so distributed them.

(2) These soil stones were totally unrolled by water or other agency.

(3) They were more bleached upon the higher than upon the lower areas. This factor, with that of their commoner occurrence upon the higher areas and a declension in their numbers as the valley's floor is reached, where they cease altogether to occur, points to the occupation of the valley by palæolithic man while its denudation was being effected.

(4) When it was further observed that the common forms of the soil stones were repeated in considerable numbers in various gravel beds upon the different levels, but which invariably gave evidence of water rolling and gravel staining, it could not but be assumed that some physical parallel connected the contents of the soils and the gravels together—*i.e.*, that the two sets of phenomena were complementary to each other. The accompanying diagrammatic section shows the general occurrence of river gravels on the valley's sides, and the distribution of the presumed palæolithic angular stones in the soils. *A* indicates the occurrence of the soil stones; *B* the area of their total absence.

It is to be concluded, therefore, that (apart from all suggestions from mere form), since these angular stones do not occur in recently

PLATE I.

FABRICATED FLINT WEAPONS FROM THE SOMME VALLEY.

PLATE II.

PLATE III.

PLATE IV.

originated soils nor in an unrolled condition in recent deposits, they are not being produced by now acting natural agencies, and were inferentially in the past not produced by natural agencies. Their geographical distribution and geological relations to sub- and surrounding strata force the inevitable conclusion that their occurrence is due to human agency; their forms, too, strongly suggest, and often undoubtedly indicate, artificial fabrication.

Subsequent investigation in the Thames and Cam Valleys, in England, revealed the fact of the geological and geographical occurrence in these areas of the soil stones, and the implement-bearing gravels, in manner exactly comparable with that of the Somme Valley.

On returning to Scotland I set about investigation of the soils, ancient river-deposits, present river-beds, "kaims," and deltas, in the valleys of the Forth, Tay, Earn, Allan, Dee, and Don (Aberdeen), and later the Clyde Estuary. The results were surprisingly similar to those obtained in the Somme Valley and in England, and may be briefly tabulated as follows:—

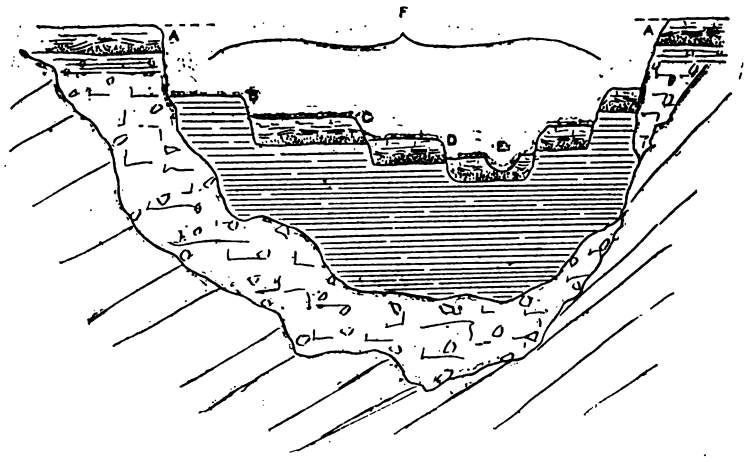
(1) Angular—*i.e.*, unrolled—stones, in shape similar to the flints of the Somme, but wanting the characteristic flaking, were found in the soils of the higher areas of the lower Tay Valley, but were entirely absent from those of the 50-feet and lower terraces.

(2) Similar stones found in Kaims and the most ancient river deposits, but more or less rolled or water-worn.

(3) These stones entirely absent, under ordinary circumstances, in recent river-deposits; if present, so completely water-worn as to be practically unrecognisable.

(4) Immediately after a heavy flood, in places where large quantities of ancient gravel have been washed down into the present river-bed, these stones may be discovered, and in a fairly fresh and unrolled condition, but obviously derived from ancient material freshly brought down.

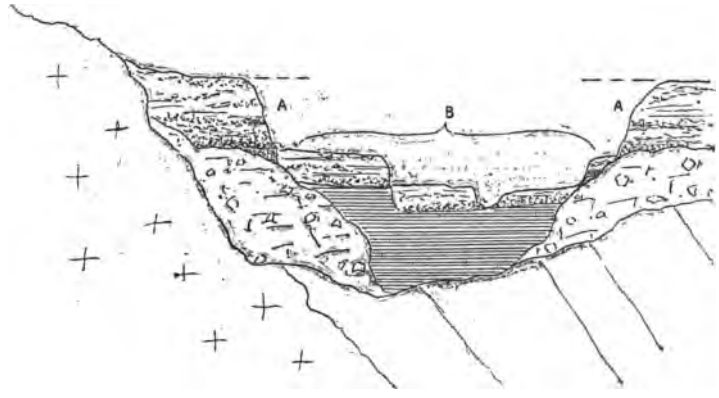
As in the case of the Somme Valley, these stones are not found in an angular or freshly made condition in present river deposits; nature is not now producing them. Again, therefore, the conclusion is inevitable that she did not produce them in past ages, but that the specimens found in the soils and ancient deposits of Scotland are the veritable handiwork of palæolithic man.



SECTION ACROSS TAY VALLEY.

A A.—100-feet terrace. *B, C, D.*—50, 40, and 30-feet terraces. *E.*—Present River Tay. Upon and above the level of areas *A A* the angular soil stones may be found. No such stones occur in the soils of the area under bracket *F.* Distance across valley by the broken lines, two miles.

The accompanying diagram of a section of the May Valley (Strathearn) illustrates the source of more or less angular and elaborated stones, which I claim to be of human fabrication:—



SECTION OF MAY VALLEY.

A.—High terrace (probably portion of ancient delta), in the material of which little rolled weapons and fabricated stones have been found. *B.*—Recent deposits and present bed of the May in which similar forms highly rolled may be discovered.

The accompanying reproductions of a few of these stones exhibit the general typical shapes. They exhibit parallels in weapon and implement with those of the south in every attribute save that of material, and the consequent absence of the dilettante work, so characteristic of the flints. In general style and form they are the same—battle-axe, chopper, knife; all are as characteristically artificial, so far as the material allows, as the typical flint specimens. And when one knows what to look for, and where and how to look, these may be found as readily in certain areas in Scotland as the corresponding flints in England or France. The more abraded and generally weathered or water-worn character of the Scotch specimens is due to the nature of the material—the only material on which our palæolithic forefathers could exert their skill.

I have found such palæolithic weapons and implements in many widely separated areas in Scotland. In those of the Tay, Forth, Clyde, the Dee and Don (Aberdeen), and in places along our coast-line. Among them will be found excellent copies of even the typical forms—the hachés of M. de Perthes' collection. There will be found many stones which have not only been artificially shaped, but whose surfaces (one or more) have been rubbed smooth, and even polished, in the operations (whatever they were) for which they had been elaborated. Some are merely split or facetted pebbles, whose surfaces have been used for some operative grinding purposes; others are hollow-ground and suggest whetstones; others, as though in illustration of the use of the foregoing, were probably knives and choppers, whose cutting-edges had been produced and maintained by grinding. These, with arrowhead and spear-tip, have been found not only in the soils but in ancient deposits which carry us straight back to the glacial period, and, indeed, I have reason to believe, actually into the glacial period itself.

As regards specimens found on the margin of the Clyde Estuary, they have probably, during storm, been lifted or floated up by seaweed from the floor of the estuary—the great hunting ground of palæolithic man during the period of the "great upheaval." Countless numbers of stones are at times thus brought ashore, some of which are surprisingly little marine-worn.

Some Data.

(a) Regarding the weapons, they not only exhibit the correct typical forms, but invariably show well-defined *cutting edges*, the

pointed end, and the *broad and heavy butt.* And notwithstanding the great abrasion they have suffered in Scotland, and their more easily abradable and decomposable nature, when placed alongside good typical flint specimens they compare well with them.

(b) In cases where these weapons (or domestic implements) have been more recently broken, as is often the case, the recent breaks, easily recognisable, have only to be restored to produce the proper typical forms.

(c) If found in a comparatively perfect and fresh-looking state, it is invariably in some *ancient* deposit; never in a river bed or recently constructed stratum. The more they have come into the hands of now operating physical agencies the less recognisable has their likeness to the typical forms become.

(d) The characteristic forms of these stones did not come about through, and by, a series of accidents—the more perfect the weapon the more striking is the evidence that it received its present, and often complicated, form in one item of time in a remote past.

(e) In the case of the more domestic implements (and sometimes in that of the weapons), the old stones or pebbles from which they have been elaborated are often shown by some part of the more ancient surfaces being retained; and then it is seen that these same stones were for unreckoned ages rolled and rounded, and sometimes externally chemically decomposed, masses, before they, in some one item of time, assumed their present forms.

(f) A weapon may be broken, smashed, say, at its point end, yet we cannot say it was necessarily broken in use. But if we find examples shaped presumably to be held in the hand, and if we find such an example to exhibit evidence of a use which could not be given to it by any known natural agent, but would naturally have been given to it by a grinding use of a human hand; or

(g) If we find knife-like examples which show that they have been broken from some ancient and highly-rolled pebbles, also exhibiting ground surfaces, such as would have kept the edges of those knife-like stones sharp; or

(h) If we find chopper-like masses, whose forms alone imply a human intention, with artificially sharpened edges in a more or

less hacked condition, we have surely something very nearly akin to proof that unity of form and condition is the result of unity of cause, since there is only one agent conceivable which could have produced such results—*and that agent is man.*

DESCRIPTIONS OF PLATES OF SCOTTISH PALÆOLITHIC WEAPONS AND IMPLEMENTS.

Plate II.—⅔ Nat.

Three Hachés, more or less water-worn—

(1) From coarse gravel in the high terrace (*A* in section of the May Valley). It is of close-grained basalt.

(2) From "kame," or raised delta, Musselburgh, of compact porphyritic rock; an excellent, though highly-rolled specimen.

(3) From the shore at Troon—of black basalt, more affected and eaten into by chemical action than by rolling or weathering. Washed up from sea bottom.

Plate III.—⅔ Nat.

Three specimens, which compare well with certain of the typical Somme Valley forms—

(1) A specimen, which, though highly rolled, still shows excellent design and workmanship; its point-end, cutting edges, and indeed the whole form are cleverly produced. It is of a heavy silicious quartzite, with bedding lines horizontal to its length. It was found on the shore near Ayr.

(2) A good specimen from ancient river bed 50 feet above the present River Earn at Crieff. Of a heavy, compact, volcanic breccia. Very slightly rolled.

(3) Highly-rolled, but fine specimen of finely laminated, close-grained schistose rock, with bedding on edge and parallel to the length—hence the recent partial loss of the cutting edge, suggested by the dotted lines. From ancient gravel deposit 60 feet above present river bed at Dunblane.

Plate IV.—⅔ Nat.

These are implements of domestic use rather than weapons; have all been artificially shaped, and all, save one, have been smoothed or ground upon one or more surfaces—

(1) and (2) knife- or chopper- like, which still show ground surfaces at (*a*) and (*b*). (2) has also been ground on the under side. (1) is from the shore at Prestwick; (2) from the kame, or ancient delta, at Musselburgh (whence also the weapon (2) in Plate II.), as also (3) on this Plate, which is probably a "mullar" or grinding-stone. It has been shaped for the hand, and is highly ground on the surface shown at (*c*).

(4) is a split stone, whose surface is hollow ground. Presumably a whetstone for the sharpening of such implements as (1) and (2), or a mill on which such a stone as (3) could have been used. From kame-like deposit at Cromlix.

(5) and (6) are from a remarkable set of almost mathematically-shaped and facetted stones, which are often rubbed or ground upon one or more surfaces. They occur in the high terrace, 60 feet above the Allan at Dunblane, and about 150 feet above sea-level.

These stones (weapons and implements) can only be fully appreciated by being handled. The photographs, without side and other views, do not do them justice. They are taken from a considerable number (some 200 weapons and implements were exhibited when the lecture was delivered), but illustrations must be limited. The author will, however, be happy to place his collection for inspection before any who are sufficiently interested to intimate a proposed visit to The Limes, Dunblane.

Notes.—It is but just to refer to a paper by the late William Gemmell, Esq., M.B., C.M., entitled "On the Discovery of late Glacial Implements in the Rhins of Galloway." See *Proceedings of the Royal Physical Society of Edinburgh* for Session 1882-83.

For several former papers by the author, see *Scottish Antiquary*, Vol. VIII., p. 147; IX., pp. 131, 167; and X., p. 82.

For abstract of paper read before Section H. British Association, Edinburgh, 1892, see "Report," p. 896.

V.—*The Scottish Vernacular as a Philological Study.* By JAMES COLVILLE, M.A., D.Sc., President of the Philological Section.

[Read before the Society, 16th November, 1898.]

THE vernacular is, properly speaking, the language of the *verna*, or "household slave." In all old societies the ruling and propertied class entrusted the infant to a foster-parent, and the work of the household to a crowd of *famuli*, and in both cases these were drawn from the lower and dialect-using classes. All, even moderately civilised, peoples were, and in a sense are still, bi-lingual. The "clerk and the lewed man" are equally required for the business of life. From the dawn of literature it must have been so. Whenever expression is consciously artistic it becomes selective and creative. The first to use verbal embroidery must have been the first stylist. One of the many indirect effects of printing has been to emphasise and fix this duality. The schoolboy, a keen observer of character, like the natural man, has a just horror of "the fellow that speaks like a book." His own diction is never recklessly original, being largely a medley of *coterie* words, as "horrid," "awful," "cheeky," "beastly," "caddish," "dashed mean," with an occasional "jolly" or "bally." More striking is the effect of hearing the average man, schoolboy, or even preacher, read aloud. At once all naturalness is lost in a monotonous, high-pitched sing-song. To these the art of using book language is an acquired taste, and retains scarce a feature of that tongue which gives to social intercourse its perennial charm.

Macaulay argued that as civilisation increases poetry declines. It would be easier to maintain that as reading and education spread, a true vernacular must gradually disappear. It loses historic continuity, and becomes a mixture of malapropisms and slang. Fashion, worst of all, taboos it as vulgar. Like divination, and poor relations, and last season's millinery, it keeps in the background. Mrs. Calderwood, a grand lady of the old school, travelling in Holland in 1758, describes to a friend a visit to a synagogue, where the priest officiated with a *harn clout* on his head. No lady would now-a-days adopt such a style, even if she could understand it. And what university reformer would

express himself as Lord Cockburn did, who observed that "when a professor grew *doited* he became immortal?" Vulgar is, after all, but a relative term, and the essence of vulgarity lies in its associations. Now all modern associations are against the vernacular. In the absence, then, of a historic vernacular how is the plain person to express himself? The style is the man, and the modern man is nothing if not stylish. He assumes the virtues of his better-class neighbour, but wears them with a difference. The suburban young lady, who is reported to have commented on the *beshed* condition of *Jeck's het*, disguised her true self in what she took to be the accent of fashion, but her choice of words betrayed her. Not so the street boy when he asked the shopman for "a happ'ny worth o' baasht plums." His style was in perfect keeping with his pretensions. A little knowledge is in language a dangerous thing, and leads to a true vulgarity in the use of words. When the maid-of-all-work asks her mistress if she will "sicken or delude the soup;" when Mrs. Parvenu is in search of "a tempory cook," is careful "to libel" the luggage when she travels, has to put on "mournings" when a bereavement occurs, and is at "a non-plush" when she finds she has not another "trumph" card, we know that these worthy people are wearing borrowed plumes. Sometimes the plain person will make quite a praiseworthy attempt to swim out of his depth in expression, as when a workman, reporting on some choked drain pipes he had been asked to lift, explained to his young master that "thae pipes wuz clean sedimateesed."

To the imperialistic gaze of the average Englishman all Scots speak much alike, and all are equally unintelligible to him. He cannot see how anyone should fail to understand *him*. If observant, however, he would find that even at home environment differentiates speech as much as plant or animal growth. In old Scotland intercourse was limited, and racial or imitative peculiarities became persistent. To say nothing of the Gaelic and the Norse districts, one could not travel over many counties without discovering differences by ear alone. A traveller of last century notes the scolding pipe of the Aberdonian and the monotonous click-clack of the Lowlander. He has the sense to see that the good English tone of the Highland districts is not confined to Inverness, but is really that of a language grammatically taught and never heedlessly employed. Their very choice of words has a literary flavour, like Baboo English.

Burt notes the peculiarities of that Edinburgh dialect, which, despite Parliament House and an earnest determination to be as English as possible, still persists. The waiter offered him for supper "a duke," "a fool," or "a meer-fool." In Fife this "duke" would be "juck"—a modification heard also in the verb, as in the proverbial caution, "Jook and let the jaw gae by." The broad *a* of the Lothians, especially if near a liquid, is as decided a shibboleth as the slurring of *t*, wherever possible, betrays an early familiarity with the "Sautmarket" of Glasgow. The long-drawn drawl, "Cauff for beds!" used to be familiar in the Canongate of Edinburgh; and in the Cowgate, which the modern Athenian forgets to call the "Coogate," for an older "Soo'gate" (Southgate), they still "baur the dore," "hing up the umber-ellie," or take "a dook at Joapie." Glasgow equally ignores historic continuity with its "Bew-kannan" Street. In its early days it was "B'whannan" and, later, "B'kannan" Street. The native loves to leave the convenience of the Broomielaw "wanst a week a' least, on Se'erday afternoon." The Borderer, again, has his shibboleth, the burr which comes out when Ridley speaks of his friend Rutherford at Chollerford or Chirnside. He of Kelso, if a clergyman, preaches about "radamption." The same vowel is heard in the local name of the town, "Kal-so." Here local pronunciation of the place-name is, as usual, correct. The ancient seal of the town bears the inscription, "*Sigillum Monasterii de Calco*"—referring to a height near which, in olden times, was a "chalk-heugh," or quarry. The Galloway man has long known the Irish "trogger," so if you ask your way of him he directs you to a short cut "farder on" by a "foot-pad." All round the Fife coast you hear the long, high-pitched drawl of some one battling with the east wind. The St. Andrews man goes into the "ceetie," or down to the "herr-burr." In rural districts the Fifer says, "Whaur arr ye gaun, maan?" in *ore rotundo* tones that fitly accompany heavily-laden heels crushing clods at leisure. Between the Tay and Moray Firths we hear nothing but thin vowels and piping tones. The distinctive feature is the *f* sound of initial *wh*. Here we are among an alert, canny folk, of keen intelligence, whether we spend a day in prosaic Dundee among "mill-fuds" and "corks," or an "'ouk" in rural Garioch with "gudges" and "getts."

These dialects, fast giving place, the school inspectors tell us, to a mongrel, characterless medley, have suffered the neglect that overtakes the familiar. Local story-tellers and versifiers have

used them as literature of a kind, but they have received no study worthy of the name. Jamieson—storehouse of much that is valuable—is here very defective. From Burns we do not receive much aid. He has given a local character to a good deal that passes for Ayrshire simply because he has used it, but, in his vernacular at least, he was not "the singer of a parish." We know too little of the sources of his vocabulary. Where his vernacular is not common to comparatively modern Scotland—that is to say, is but English with a provincial look about it—its source is the poet's reading in Ramsay, Fergusson, Hamilton, and the treasures of ballads and popular verse. He is so little vernacular as never to use the characteristic relative "'at"—witness "Scots wha hae" for "Scots 'at hes," or such a common colloquialism as "div" and "divna."

If we turn from the diction of dialect to grammar and accent we have nothing to guide us but Dr. J. A. H. Murray's monograph on the dialects of the South of Scotland. There is, indeed, no work on the phonetics of dialects in the United Kingdom. And all is passing away of the old and only the new and the vulgar remains. Yet what a wealth of national character, social customs, folklore, lies in dialect! It represents the operation of individual enterprise in language, rapidly being crushed out by the Juggernaut of collective trading through literature and education. To gather up what remains is not the work of one, but of hundreds. Germany devotes imperial funds and the marvellous philological instincts of an academic people to such work, and even little Denmark has kept a student for months in the Fair Isle observing and collecting.

The sturdy survival of a vigorous vernacular, alongside of a language of books and of education, must go far to account for the fact that Scotland's contribution to English literature has been, both in quality and quantity, out of all proportion to her size and position. Her authors have never needed to strain after such artificialities as characterise the Renascence period, or the efforts of educated Hindoos in our own day. Thus it is that men so markedly in touch with the vernacular as Burns and Carlyle, stand out prominently among all English writers for the actuality of their vision, the mingled virility and veracity of their style. For a healthy vernacular is constantly evolving itself under the natural influences of dialect growth. The effect of education on the literary speech is to develop expression by the hard and fast

rules of imitation, by "the days and nights devoted to Addison" and his kind. But a vernacular lends itself naturally to local environment in the selection of words, the meaning put into them, the idioms, the tones of voice, the vowel systems, and all that gives to style its colour and individuality. Scotland, from the archaic character of its development, from the fact that a vigorous race found its native tongue early shouldered out of general literature, presents a specially rich field for the study of dialectic growth.

The intelligent observer cannot fail to be struck with the substantial resemblance that runs through the main stock of vocables in vernacular use over the Lowlands, combined with well-marked differences of tone and accent. This is a field of study that one might say has never been worked. To show something alike of its variety and extent, let me present gleanings from two such far-sundered districts as Campbeltown and East Fife. As is well known, the Argyle family not only gave its name to the thriving burgh of Kintyre, but transferred in making it a fresh population from Ayrshire, in thorough sympathy with its pronounced Covenanting proclivities. The result has been to produce such a curious blend of Celtic and Saxon as we find in the following specimen, the phrases of which, though now almost extinct, were in common use in Campbeltown in the earlier part of the present century:—

FLORY LOYNACHAN.*

A most pathetic ballad, the composition of Dougie Macilreavie, of Corbett's Close, in the Bolgam Street, Campbeltown. Inscribed, with affectionate regards, to the members of the Kintyre Literary Association, as an illustration of the common conversational idiom of the dear old town half a century ago.

By an old Campbeltonian.

O, it buitie be an ogly thing
That mougres thus o'er me,
For I scrabed at mysel' thestreen,
And could not bab an e'e.

---

* GLOSS BY A NATIVE OF CAMPBELTOWN.

1. *Buitie*, must be. Sc., *bude*, behoved.
2. *Mougres*, creeps over.

My heart is a' to muilins minched,
Brye, smuirach, daps, and gum,
I'm a poor cruichach, spalyin' scrae,
My horts have struck me dumb.

Dear Flory Loynachan, if thou
Thro' Saana's soun' wert toss'd,
And rouchled like a shougie-shoo,
In a veshal with one most;
Though the nicht were makan' for a roil,
Tho' ralliach were the sea,
Though scorlins warpled my thowl pins,
My shallop would reach thee.

Thou'rt not a hochlan scleurach, dear,
As many trooshlach be;
Nor I a claty skybal, thus
To sclaffer after thee;
Yet haing the meishachan, where first
I felt love's mainglin' smart,
And haing the boosach dyvour too,
Who spoong'd from me thine heart!

---

3. *Scrabed*, scratched. Celt., *sgrob*, a scratch, furrow. Cognate Lat., *scribo*, I write. Eng., *scrape*.
4. *Bab*, close, Ayrsh.
5. *Muilins*, bread crumbs.
6. *Brye*, pounded sandstone. Cp. briz, bruise, bray.
7. *Smuirach*, very small coal. Sc. and Celt., cp. *smoor*, *smore*, smother.
8. *Gum*, coom, coal dust.
9. *Cruichach*, crooked and bent. Cp. cruck, crook.
10. *Spalyin'*, flat-footed.
11. *Scrae*, skinny fellow, a shrivelled old shoe.
12. *Horts*, hurts.
13. *Rouchled*, tossed about. Cp. *roch*, rough.
14. *Ralliach*, slightly stormy.
15. *Scorlins*, slimy, cord-like seaweed.
16. *Hochlan*, slack in dress, walking clumsily. Cp. hobble.
17. *Scleurach*, untidy in dress and gait. Celt., *sgliurach*, slut, gossip, young sea-gull.
18. *Trooshlach*, worthless thing. Cp. trash.
19. *Claty*, dirty. Sc., clarty.
20. *Skybal*, worthless fellow. Celt., *giobull*, chap, odd fellow.

O ! rhane a Yolus Cronie—quick—
  Across this rumpled brain !
Bring hickery-pickery—bring wallink,
  Droshachs, to sooth my pain !
Fire water—fire a spoucher full—
  These frythan stouns to stay !
For like a sparrow's scaldachan
  I'm gosping night and day !

Were I the laird of Achnaglach,
  Or Kilmanshenachan fair,
Crockstaplemore, Kilwheepnach,
  Foechag, or Ballochgair ;
Did I inherit Tuyinroech,
  Drumgary, or Ballochantee,
Creishlach, or Coeran—daing the bit
  I'd fauchat them for thee !

---

21. *Sclaffer*, go slipshod.
22. *Haing*, a small swear.
23. *Meishachan*, subscription dance. Cp. *minsh*, a change-house.
24. *Mainglin'*, crushed, mangled.
25. *Boosach*, drinking.
26. *Dyvour*, poor-looking individual. Lat., *debtor*. Fr., *devoir*.
27. *Spoonged*, stole deceitfully.
28. *Rhane*, rhyme. Celt., *rann*, a quatrain, portion. Cp. *runn-rig*.
29. *Yolus cronie*, a charm (in words). Celt., *eolas*, knowledge, *eoisle*, a charm.
30. *Rumpled*, confused.
31. *Hickery-pickery*, tonic bitters. ἱερός, sacred. πικρίς, a bitter herb. See Chamb. Encyc., Art. "Hiera Picra."
32. *Wallink*, brooklime speedwell.
33. *Droshachs*, doctors' drugs.
34. *Spoucher*, wooden ladle for baling a boat. Sc., *spud*, spade. Cp. Celt., *spuidgear*, a baling ladle.
35. *Frythan*, cook in a *frying*-pan.
36. *Stouns*, sharp pains. Cp. a stoond o' love.
37. *Scaldachan*, unfeathered nestlings. Norse and Sc., *scalled*, bald.
38. *Gosping*, gasping.
39. *Daing*, a small swear.
40. *Fauchat*, to throw up a thing. Cp. *feech* ! expressing disgust.
41. *Clabbydhu*, black shellfish like a large mussel.
42. *Crouban*, a crab.
43. *Anachan*, bivalve used for bait.
44. *Brollochan*, similar, with a little difference in shape.

O, the Clabbydhu, it loves the Trinch,
The Crouban, the quay-neb,
While the Anachan and Brollochan,
They love the Mussel-ebb.
The Muirachbann the Dorling loves,
And the Gleshan, and Guildee,
They love to plouder through the loch;
But, Flory, I love thee!

While the place-names of Fife give ample evidence of a primitive and long-existent Celtic population, its vernacular is characteristically Saxon. The great majority of its vocables must be, therefore, fairly familiar "frae Maidenkirk to John o' Groats." As a means of stimulating observation, and suggesting similar treatment for other districts, I cannot do better than take a well-defined area of "The Kingdom," and present a bundle of dialect gleanings stored up in the memory. The words recur with a flood of reminiscence. There is the red-tiled kirk town, straggling over the school hill, on whose slopes one looked down upon kailyairds, where the hedge sparrow and the yite jinked the handy stone, and pig-styes, wherein the soo grumphed sleepily or crunched stomachic cinders. Pleasanter is it to watch that part of the brae where pre-historic villagers had laid their dead, only to leave cosy recesses among the nameless stone coffins for lassies to play at selling sugar and tea with the crisp, bony soil. Higher up the hill stood a newer God's acre, but even it so old that the accumulated soil covered and concealed the sculptured base of the thirteenth century tower, beloved of artists and architects, while the back walls of the houses, thriftily built hard against the abodes of the dead, had their window-boles looking

---

45. *Muirachbann*, white shellfish got near the ebb. Celt., *maorach*, a shellfish.
46. *Dorling*, line of shore joining isle to mainland. Celt., *doir linn*.
47. *Gleshan*, coal fish.
48. *Guildee*, young of the saithe.
49. *Plouder*, plouter, plunge.

For the Celtic of this gloss I have to thank Mr. Alexander Macbain, M.A., author of "An Etymological Dictionary of the Gaelic Language" (Inverness, 1896), and the verses, a cutting from a local newspaper, I owe to my friend, Mr. Matthew Dunlop, of Dunlop Brothers, Bothwell Street, Glasgow.

out upon the graves through a screen of nettles and dockens, "apple-reengie" and "heather-reenge," as the villagers called the favourite southern-wood and hydrangea. To eastward the hill tailed off in a long reach towards the open sea, across a wilderness of heath and delicious sward of heather and whin and broom, till it lost itself amid miles of golden sand, where the swish of the breaking wave mingled with the moan of the bar as the turn of the ebb brought in the rush of billowy foam to hide the mussel scaups and lagoons, dear to the flounder and the heron, the mussel-picker and the whaup. To westward the school hill dropped to the trough of a wide valley, which drained to nowhere in particular, but of old its countless lochans and forest of seggs and reeds must have been a paradise to the falconer and the fowler. Out of the wilderness of marsh rose an artificial mound, on which stood for centuries a stronghold of the Earls of Strathmore, but the last laird went out in "The Fifteen," and the forfeited estate fell to the York Building Company, which tore down the venerable pile, noted for the painted ceiling of its hall, to make cow byres. Nothing remained but two rows of yew trees and the ditch that drained the moat. Its name, the Water-ga-tailie, concealed the fact that here had been a raised causeway, the water-gate alley, that communicated with the kirk toon across the valley. This sluggish stream was a favourite haunt of "gellies," as tadpoles were called, the old name for the sliddery leech. An improving modern laird ran a straight, deep-cut canal from end to end of the marshy hollow, turning it into fields of the richest loam. Down the school hill ran the main street by the Paith, where one had to keep to the "croon o' the causey" to shun the drip from the roneless eaves. The street was continued across the drained valley by a newer line, where the feuars planted their trim cots, and plied the shuttle and reeled the pirns in sweet content, in the pre-Malthusian days when a lying-in brought a welcome bread-winner:—

> "The weaver said unto his son,
> The day 'at he was born,
> 'Blessin's on yer curly pow!
> Ye'll rin for pirns the morn.'"

The brisk times of the great war, when Osnaburgs kept all hands busy, were followed by two disasters. A great railway tore its ruthless track across the smiling hollow, and buried the placid burn deep down in a gloomy condie, the home of eels and

puddocks and drowned kittlens. The old-fashioned gardens, with their brier and elder and rizzar bushes, their hawthorn and gean trees, their artless clumps of bachelor's buttons, gardener's gairtins, dusty miller, balm, spinks, apple-reengie, speengie roses, spearmint, and lily-oak, gave place to coal bings (Fife knows not "coal-rees") and lyes for trucking "tawties" and "nowt." About the same time appeared the second source of unrest and change and bad blood, the new broom of Dissent. Down at the lower end of the toon rose a subscription school, where a learned unfortunate starved on £10 a-year, school pence, and non-Intrusion principles. Near by a barn-like Free kirk opened the door of its gavel-end on the high road to welcome the swarm from the Erastian hive. The tailor's wife eagerly took the new road, coveting the eldership for her man. Discussing church politics amid a circle of her "cummers," she stoutly maintained that the days of auld Babylon on the school hill were numbered, and that every one must gang doon the toon if she wished her soul saved.

Those were the days, *consule Planco*, of sunshine and gladness, when the worry of the great world was far remote. The faint boom of guns in Edinburgh Castle told of a Sebastopol fallen, or the wonders of the Crystal Palace were revealed on the covers of school copy-books. For the *Scotsman* was then a threepenny biweekly, and the one copy that came, franked by its stamp, went round its circle of readers in turn. The circulation was managed by the sergeant, a veteran of the Kaffir wars, and a striking contrast to Sandy Arnot, a battered, one-armed wreck from Chilianwallah and Sobraon, who had nothing more interesting about him than a rusty black cut-away coat and a passion for snuff and the speediest liquidation of his pension. The sergeant was intelligent, and every inch a gentleman, with straight and broad shoulders, bronzed, clean-shaven face, broad leather stock for collar, striped blue and white shirt with pearl buttons, blue fatigue jacket with brass buttons, and corduroys of the pattern known as California, name due to the late outbreak of "yellow fever" on the Pacific coast. He was a bachelor, and lodged with a tailor, whose long, ill-girt figure had got for him the name "Deuteronomy" from some village wit. The sergeant mainly employed himself in digging up barrow loads of fir roots, highly resinous, and excellent for kindlin'. The village had long passed the age of the bog candles and the peerie-man, a stand with a notched stick a-top to hold the spails previously dried behind the cruck and in the ingle-neuk. Oh! those glorious days

in that wood where the sergeant dug and peched at every sturdy blow. Heavenly were the sloping glades where one beaked in the blaze among bracken and blaeberries and bell heather, while whin and broom pods plunkt their peas on ruddy cheeks, and the fir-cones, or taps, that lay thick on their bed, turned out their russet recesses to the birsling sun, and the foggie-toddlers hirpled about their business in the warm sod, among golacks and clip-shears, while the grasshoppers chirped in merry concert. The hum of bees and the chorus of birds mingled overhead in the sough of a languid breeze, and everything made for righteousness but the buzzing flies, the nagging midges, and the quiet but thorough prod of the clegs. There was too much of the lotus in the air to tempt one to risk a jobbing by prying into the whin-bus' for the mouse-hole entrance to the rannie's home, to sclim the branchless stem of the fir for the keelie's nest, or even disturb the sugar industry by cutting into the bark of the birches to suck the sweet sap that seapt out on the sunny side. Pieces were exhausted, and pooches reipet for mülins, while the shady banks of the ditches were searched for soorocks, and the dank spots in the woods for Caliban's earth-nuts, or "lucy awrnits," as they were called—for botanising was followed with the practical purpose of the primitive man, and spoils secured for use or pleasure. Pet rabbits claimed the sookies ("clover heads") and the "grundie-swallie," for groundsel was known by its Anglo-Saxon name of "grunde-swyligie" or "grunde-swilie." "Little goodie" (sun spurge) was plucked for its acrid juice, a specific for warts, while the benty dunes were searched for the roots which a too catholic taste chewed as liquorice. The elder furnished a boon-tree gun, the elm a whistle, the hemlock stalk a spout-gun, while the brown, withered leaves of the tussilago or colt's-foot—"dishie-logie" it was called—were eagerly utilised as a substitute for tobacco, and smoked with difficulty in a partan's tae. When the girls played at shops, the seeds of the docken passed for sugar and tea, while the sweeties were cones of the alder, as it resembled in form the genuine curly-andrew or sugared coriander seed. More serious was the mid-day interest on the school hill in that humble weed, rib-wort. When the leaf was broken off by pulling, the exposed ribs were counted as a forecast of the number of pawmies to be faced in the after-noon. The long stalk, tipped with its seeds, the curly-doddie of those days, furnished a weapon for mimic cuts and slashes, each combatant trying who should first break off his opponent's stalk.

More formidable swordplay was done with a kale-runt or a clump of the malodorous weebie, as the yellow and ever-assertive ragwort was called. The animal world was closely observed. Keen was the zest in the chase of a whittret or the smeekin of a wasp's bike, the only noxious beasts known to us. Among birds the yellow yite met with no favour, relic of a mediæval tradition that its yellow robe suggested the detested Jew, possibly Judas Iscariot himself. In the cabbage rows a pit-fall (a "faw," Ger. *falle*, it was called) was set for him. When snow covered the ground, the barn wecht or close sieve was the favourite trap. Spring, however, afforded more varied sport among the birds. There was no thought of blowing eggs for collecting, rather were they set up on a dyke as a mark in the sport called "prappin." A cushie's nest, and still better a paitrick's, was prized. Sunny hours were spent out on the moors in search of "dunter's" (eider duck) or "strokannet's" (burrow duck) eggs, hid away in rabbit holes. With a kind of awe the "teuchat" (lapwing) was followed as it wailed out in circles round the intruder, "Peese-weet, peese-weet, hairy my nest and gar me greet!" Attempts were made to rear small birds, with but little success. The young gorbets were fed on crowdie till their "gaebies" (crops), if not their nebs, called "Hold! enough!" The sparrows, or "spyugs" suffered most from such experiments. But we never were such Herods as the Border herd-boys, with their "spung-hewet" or "spung-taed" pranks. This was to place a puddock or taed on one end of a stick balanced on a stone, then strike the other smartly so as to send the victim high up into the air, to fall neatly cleft in two. Some of the old herd-boy's sports were kept up, however—such as the flauchter-spade and the fight with feals or divots. The name "flauchter-spade" would seem to be peculiar to Fife. In Lanarkshire the boys know the game as the "sawmon-loup." The true flauchter-spade was used in the old days of bad farming to pare turf from the moorland or outfield, to make the compost known as "fulzie." Near home were the pleasures of the garden, the playground, and the farmyard. Round the garden ran a high, flat-topped wall, clad on the sunny side with rizzars, and delicious it was to speel it, and strip the pleasantly tartish berries from their pendulous stalks. Still more attractive were the geans and the grozers.

On the village bleaching-green there was the usual round of games—"hi-spy," "smoogle the gag," "tig," "craw-flee." In their due seasons came "bools," "peeries," "carrick," "girds,"

and "draigens." Football and cricket were unknown, so also was the popular rounders. We knew nothing, therefore, of that interesting survival amid the wreck of old words, the "dulls" or "dools" of Allan Ramsay, still common in the west. Girls chose the quieter sports—"merry-my-tanzie," "jing-a-ring," or the ever-entertaining "palall," the "peevor" of Lanarkshire. If play-mates were by-ordinar thrang, they were reported to be "cheef;" but when they fell out, they parted saying "I'm no freends wi' you the day." Poetical justice was gleefully acknowledged with a "cheatery's chokit ye!" or "ye're weel cheap o'd," when Nemesis brought ill luck. "Fair Hornie!" was the general appeal for honesty in games. To secure a good thing it was sufficient to say "Chaps me that!" All enjoyed giving each other "fichils" (Gael. dialect, *fachail*, strife) or challenges to difficult feats—the "brags" of Edinburgh and the "coosie" of Arbroath. Hiding in crap-wa's and coom-ceiled recesses in the hay-loft was much relished. The dread of everyone was to be called "bairnlie," "coordie" (the "coordie, coordie custard!" of Edinburgh), or to be sent home with a torn "daidlie" (pinafore). "A carrier of clypes," dreaded in the west, was never heard in Fife. If it was a question of sides in a game the lot was cast by the inevitable decision of "Nivvi-nivvi-nak-kak! which hand wull ye tak'!"

Glorious were the long summer evenings, when the bairns were as happy on the village green as the gowans that nestled in a sleep which their tread did not disturb. As the gloamin' from the east chased the azure day far to westwards, the golden moths flitted over the breer-busses, the corn-craik scraiched among the "skellocks" (charlock or wild mustard) in the haugh-land, while the bat circled overhead, easily evading the bannets tossed up to catch it with the seductive cry, "Bat, bat, come intill my hairy hat!"

But all this paled before the delights of hairst. Eager was the look-out for the first stook as authority for demanding the longed-for vacations. Rapidly gleamed the hyucks in sturdy hands when some forward shearer began kempin (Ger., *kämpfen*).

> "This wicked flyte being laid at last,
> Some rig now strives for to get past
> The ithers, and wi' flaring haste
> To show its strength;
> This sets the lave a-workin fast—
> They *kemp* at length."
>
> —*The Hairst Rig, 1786.*

The grieve looked on with mingled feelings, divided between a desire for snod stubble and a speedy arrival at the rig-end. Sweet was the mid-day meal of baps and ale by a stook side, varied by a chase after a frightened rabbit or a hirplin maukin. The leadin' of the well-won thraves appealed to the boy's love of horses. He took but little interest in the industrious gleaners that followed, making up their singles out of the scattered ears:—

> " O' gatherers next, unruly bands
> Do spread themselves athwart the lands,
> And sair they grien to try their hands
> Amang the sheaves;
> * * * * * * * *
> For which they're ordered far behind,
> To mak' sic *singles* as they find."
>
> —*Hairst Rig.*

Winter brought its own sports. Frozen pools in the woods were common—long, black, weird-looking lanes, overshadowed with gloomy alders, whereon hung last year's nirled cones—and resounded to the rush of the skaetchers. Open snow-clad stretches showed the sheen of slides, on which in gleeful rows the boys careered, erect or hunker-tottie. All went well till the approaching thaw made the ice bauch. The long evenings favoured such pranks as "Tammy-reekie," "Ticky-molie," and "Guisin." Nor were festal ploys awanting. There was Hallowe'en with its supper of stovies, "a pound of butter champit in," said champing being effected by a vigorous use of the porridge stick, or "theel." When the pig was killed a feast of cracklins and puddings followed. There were such special aids to friendship as "clack" (cp. Ger., *klecks*, a blot), the "gundy" of Edinburgh youth, "pawrlies," and "ha'penny deevils," each offering a more popular fate for spare bawbees than the "pirlie-pig."

The farm, its ways and animals, were ever fascinating. The boy was a stock-raiser on his own account, and great was his interest in the breeds of doos and rabbits. The mappie was his favourite pet, while the niffering of its progeny, or swauping the cleckin for knives and bools as buit, served as a training for a commercial career. The two terrors of the farmyard were the bubbly-jock and the billy-goat. The latter was treated, across the wall, to sham offers of tobacco. For the former was reserved the execration, "Bubbly-jock, your wife's a witch an' a' yer bairns are warlocks." But proudest of all was a boy of the friendship

of a horse. He knew his "monk" or head-stall, his haims, brecham, britchen, and rigwoodie. To walk alongside of him when he was in the theats, or to hold the reins beside the swingle-tree when he was in the plough, was a coveted distinction. In the smith's hands the horse was equally attractive. The flaws or ends broken off the shoe-nails were prized to aid in joiner work. The treviss or framework for restive horses served as a sort of gymnastic apparatus. With the cow there was acquaintance, not friendship. There was the bother of grazing her in green places for hours by the branks, and the terror of bringing her home heftet or seized with hovin, the effect of grazing among wet clover. In the stall she was secured by the baikie, an upright post. The open trench or "gruip" made the byre unsavoury. Its name is still as familiar in the Transvaal as in Fife. In Ulster it is applied to any kind of ditch. The cow's calving was momentous, for on that hung the milk supply. If she was either "yeld" (in calf but not in milk) or "foarrie" (not in calf) there was no milk, but only a poor substitute, treacle-peerie, made of sweetened water mixed with barm to produce a kind of ale, and feebler even than penny-whaup. The "beist," or strong milk after calving, was disagreeable to the taste. When the milk was drawn in the cog it was "sie'd," or strained, laid away in kimmins, and reamed for the churn. Rarely was the sweet or unreamed milk used for drinking, a sufficient substitute being found in the skimmed or the butter-milk, known as "soor-dook," the *sauerteig* of "Sartor Resartus." The Edinburgh schoolboy, seeing in the militia the ploughmen that brought the milk to town, derisively christened them "soor-dook sodgers." For cheese-making the stomach of a calf was held in reserve, filled with salt and hung up over the cruck in the jambs, to make rennet, or "ernin." The pig was of little interest to the boy, except perhaps the wee wrig, or *puis-nè* member of the litter. Beginning life as a grice, the pig when speaned became a shot, and while assuming a douce obesity was familiarly addressed as "Güs-Güs!" or "Sandy Cam'l," a name widely spread over the Lowlands. The popular opinion that made proverbs took a purely material view of the pig. The old folk capped the incongruity between pearls and swine with—"What can ye expeck o' a soo but to grumph?" The last scene that ended his uneventful history was the bustling one of stickin' with the gully, ploatin' in the big tub, scrapin' and disem-

bowelling. Odd hours in the busy day were given to watching the joiner, ever popular if good-natured enough to turn peeries, or the mason swinging his heavy mell. Not so popular he, to judge by his derisive name, "dorbie." The long winter evenings were often spent amid the light and warmth and bustle of the craftsman's shop. The handloom weaver, a contemplative artist whose craft had by this time almost disappeared, was coaxed into sparing the ends of his warp or thrums to make strings for draigens, or the tow from his yarn to supply shot for spoot-guns. The tailor was voted a windy buddy, much given to blawin' or boasting. Odd uses were found for his ruends, and there were sly pilferings of his keelivine. The most interesting operation to watch was the hot goose hissing along the damped seam over the law-brod. The sutor was in every way more intelligent and entertaining as he beat the bend-leather on his lap-stane, drew his thread across the roset, deftly birsed a fresh lingle-end, or passed the gleaming elshon through his hair. In those days there was no lack of variety or interest in village industries, as yet little affected by machinery, or the rush to the big toons. All this is commemorated in the Fife toast:

> "Here's life to men and death to fish,
> The pirn and the ploo',
> Horn, corn, linen-yairn,
> Tups and tarry 'oo'."

It was around the ingle-neuk where character was both formed and best studied. Lessons played a small part in the evening economy, for school counted for little, and the maister was held in no great esteem among the monotonous drudgery of coonts and catechism, and the mechanical sing-song called reading. For the well-doing the highest praise was—"Ye'll be a man before your mother yet," while for the be-fogged bungler there were the choice epithets, "kirn-stick," "dunderhead," and the ever-ready "pawmy." Neither the mediæval "pandy" of the Edinburgh boy, nor the Saxon "loofie" of the Glasgow one, was known in Fife. Little effort was made to put any soul or meaning into what was read. A boy of those days encountering in his text-book the lines—

> "Around the fire one wintry night,
> The farmer's rosy children sat,
> The fagot lent its blazing light"—

and so on—had a vision of an untidy drudge troking about the kitchen, for such was implied in the local vernacular by the

mysterious "fagot." The kitchen was the common room of humble households. The door, secured by a sneck, opened upon a short passage, the trance, connecting the butt and the ben. Against its wall stood the trap or ladder leading to the garret. When a neighbour slipped in for a crack there was some art in introducing himself to the household, so much so that a wily, pawky flatterer was known familiarly as an auld "sneck-drawer.' The centre of the kitchen was the well-caumed fireside, the saut girnel in the jambs, the goodman's seat between the lowe and the candle, and pussy bawdrons not far from the warmth of the ace. Thrift prescribed a big gatherin' coal backed by "chows" (small coal), or, at the worst, "coom" (dross). On the mother's knee began the knowledge of the vernacular. How the peekin, dwinin bairn was brightened up by "Creepie, crappie," or "Bree, bree, brentie," or—

> "John Smith, a falla fine,
> Can ye shoe this horse o' mine?"—

while screams of delight greeted the *denouement* of the tale—

> "This ain biggit the baurn,
> This ain stealt the corn,
> This ain stood and saw,
> This ain ran awa—
> An' wee pirlie-winkie paid for a."

The goodwife was an authority in minor morals, keeping careful watch over her flock as maturing years expanded character. An awkward girl was reprimanded for a "muckle tawpie," a foolish boy was a "haveril," a "gawpus," or a "gomeril." The easily-imposed upon simpleton was a "cuif," or a "nose o' wax," for mental smartness was highly appreciated under the names of "gumshon" or "smeddum." The elder sister, "fikey," and "perjink," was severe on a younger brother's hashiness, but the douce mother showed a wise tolerance. "Auld maids' bairns are never misleared," she would remark. She tholed much from the wheengin, raenin (Gael., *ràn*, roar, cry) bairn, but soon got out of patience with the thrawin, contermashus youngster that would have his own way. The gansel or insolent retort of the pert smatchet was sternly rebuked equally with the airs of the up-settin' brat. Table manners were attended to in blunt fashion. The hasty eater was warned not to ramsch his food. To snotter or to slaver was no less objectionable in the callant, the loon, or the haflin. Too much assurance was rebuked with, "Ye're no blate." The impatient cry

for dinner was soothed with, "It's on the hettest pairt o' the hoose," or "It's braw to be hungry and ken o' meat." Dainties were reserved for elders, and remonstrance elicited only the proverb, "Corn's no for staigs." Grown up folk held the young with a ticht hand, dealing out skelps and paiks with liberal allowance. The young man who could not speak out for himself was voted a "sumph." The tomboyish girl was condemned as "roid," the light-headed as "giglot." The mischievous boy was a "monkey," a "loon-looking dug," or a "limb o' Sawtan." The throo-ga'n mother could not endure sloongin, the couthie one had no patience with gloomin, stoomin, or dortin, while the furthie housewife had nothing near about her hospitality. The ill-set rascal, the ill-doin waffie, and the wairdless vagral body found no favour, and when some one had to go ane's errand on a particular service, no mercy was shown to him that said he was "deid sweer," or "would be sick sorry." To gossip was condemned as clashing. The severest criticism of conduct indeed was directed to the frailer sex, progressively characterised by the epithets—"gilpy," "besom," "hizzie," "harry," "randy," "limmer." To get into debt was to tak on. To run the cutter betokened a confirmed habit of tippling. To be a sand-bed o' drink accompanied the capacity for constant boozin'. A crack over the stoups filling at the well or the pump was accentuated with such expressions of surprise as, "my certe," "my san," "losh peetie me," "goavy-dick."

The inborn habit of thrift led to fine distinctions in expressions for small quantities—a tate, a curn, a stime, bittock, puckle, wheen, feck, hantle, a gowpen, a nievefu. The best qualities of the goodwife came out in distress, as when a glisk o' cold or a groosin brought on a hoast, or foreboded the nirls, or maybe the more serious broonkaidis; or taebetless fingers had to be thawed in loo water; or skelbs and hacks needed tender handling. But the case was altered if a thoughtless pliskie brought a broken lozen. Should playmates fall out there was little sympathy with the cloor on the head, the dad i' the lug, or the bluidy nose. "Best tholed, soonest mended," was all the consolation. Grown-up people spoke more gravely of an inward trouble, an income, a weed, rose, or the pains. A cut was delayed in healing when the proud flesh appeared, or it began to beal and form a gatherin'. A common symptom of indigestion was the water-brash. And after all there were dispensations that could only be tholed. The undergrown was a "droch," the curved spine was "boolie-backit,"

the cleft palate was the "whummle bore." But worst trial of all was that heavy handfu', the helpless naitrel or harmless loonie.

A list of about 350 words, embracing much of the vernacular that has been used in the foregoing pages, was, in view of this paper, reported on by obliging correspondents in East Fife, Angus, Hawick, South Lanark, and Galloway. The reports bore evidence to the very general diffusion of these Fifeshire expressions. It must be said, however, that the reporters were all in sympathy with the archaic in the vernacular. In the one case where the present generation was taken into account, East Fife, a very large proportion of the words were found to be now unknown. As this was the very district where the material of the paper was originally gleaned, we have here a striking proof of decadence.

Though the words were upon the whole familiar to some of the districts, there were, in many cases, curious preferences—both when there was close proximity, as Fife and Forfar, and again at wide intervals, such as Fife and Galloway.

I select the following as reported blank (absolutely or in the sense or form given here) from all the districts, except, of course, parts of Fife :—

Gellie, leech.
Tiki-molie, boys' trick.
Gutter-gaw, sores between toes of bare-footed walkers in puddles.
Fichils, feats.
Pennart, tin case for penholders.
Seek sorry, unwilling.
Chows, small coal.
Speengie-rose, peony.
Cummins, in malt. Jamieson has "*Cumin*, wort."
Hagg, tends fat cattle.
Treviss, frame to shoe horses ; common in other sense.
Flauchter-spade, boys' game.
Hunker-tottie, cowering slide.
Monk, horse's head-stall.
Nose o' wax, ninny.
Sand-bed o' drink, drunkard.
Giglot, laughing girl.
Whummle-bore, cleft palate.
Onbonny, ugly.
Shelly-coat, tortoise-shell moth.
Meedge, mark to steer by.
Thro-pit, go.
Rämin, whimpering.
Fuggy-toddler, humble bee.
Peeler, soft crab.
Ringle-e'ed, wall-eyed.
Stoom, to look sulky.

It might also be said that these are not in Jamieson either, if one might speak positively on such a point. Upon another set of these words corroboration was got only from Jamieson :—

Coo-baikie, pole securing cow in stall.
Dunter, eider-duck.
Strokannet, burrow-duck.
Poddlies, young saithe.
Gurthie, nauseous, what "staws."
Flaws, ends of horse-shoe nails.
Fraekin, wheedling.
Wrig, puis-nè grice, or young pig.

Golack, beetle.
Kimmen, a milk-pail.
Carrick, shinty stick.
Furthie, liberal.
Bauk, grass walk in a garden.
Gansell, insolent retort.
Spar, close a gate.
Keelie, sparrow-hawk.

These lists are given merely as specimens of what are purely local and, in some cases, lost words.

For the very common Fife word, "*reed*, cattle yard" (reported blank in other districts), Jamieson has only "sheep-ree (West Fife)." In regard to all these purely dialect words it would be most desirable to have extended and exhaustive observation. Such a select glossary, if widely reported on, would open up an unworked field. Finally, it must be said of all the vernacular in this paper that it records only the observation of actual usage within a special area, and attempts no treatment of history, structure, or kinship with other words. Be it always remembered that philological research has three distinct fields—(*a*) the history, genesis, or kinship of a word; (*b*) its various applications; and (*c*) if vernacular, its distribution. These are precisely analogous to the great departments of research in any of the natural sciences of observation. The scholar must be left to speak of the first through his dictionaries. For the other two "the plain man" may well be a most valuable and competent witness; but to gather his evidence demands wide observation and generous co-operation. The foregoing pages have attempted to show that the plain man's field of observation possesses a broad, human interest, in which dictionary-making must be deficient.

NOTE.—An additional select glossary was subsequently distributed over a much wider area, embracing virtually all non-Highland districts. The results will reveal, when worked out, a rich field for dialect study. To my most obliging, and in many cases surprisingly well-informed, correspondents, my best thanks are due. In the meantime any interested reader of this paper will do a patriotic service as a worker on similar lines by drawing up local glossaries, or by noting anything deemed of value as germane to the subject. To express sympathy or offer criticism is an easy matter, but it is more difficult, though vastly more meritorious, to help in original dialect work. The paucity of such material is at present the great obstacle to progress.

VI.—*Imperial Grants considered as Adjustments of Taxation.*

By W. C. SMITH, Sheriff of Ross and Cromarty and Sutherland.

[Read before the Society, 15th February, 1899.]

THE growth of local taxation is one of the commonplaces of recent economical and political discussion. Let me illustrate by the figures relating to Scotland. Nothing is gained for purposes of comparison by going back so far as Sir John Skelton did in his admirable Report of 1894. I prefer to take the year 1867, when the first effective Public Health Act for Scotland was passed. In that year the amount of all rates levied in Scotland was £1,793,000. In 1896 the amount was £3,995,000. I need hardly say that these figures do not include the receipts from gas and tramways. Of this sum of practically £4,000,000, urban or burghal authorities levied £1,681,000; county councils levied £685,000; and parochial authorities levied £1,581,000:—I exclude the vanishing factor of ecclesiastical assessments. The average rate per £1 for these three classes of authorities was 2s. 5d. for the urban authorities; 1s. 0·4d. for county councils; and 1s. 3½d. for parochial authorities. As regards the urban and parochial authorities, the increase has been mainly due to the new or remunerative assessments, such as education and public health. As regards the rural authorities, the increase has been proportionally greater in the old or non-remunerative assessments, such as poor and police. Over the whole country the burden of local taxation has increased more rapidly than the value of the property on which it was levied. In 1867 the average rate for all purposes was 2s. 0½d.; in 1896, 3s. 2·3d.

That is, roughly speaking, the present position of local taxation, but it is difficult, either in theory or in fact, to lay down any absolute dividing line between the proper limits of local and imperial taxation. In one sense the whole State is interested in the proper transaction of public business in every county, parish, and burgh. Of course, there are many functions of the State that cannot possibly be devolved upon localities. For example, unity

£38,381,000 of outstanding loans due by the various lending departments of the State and by some investments. If you take the closed and unclosed loan services together you have the large total of £131,143,000, which includes several political items apart from the normal working of local administration. Of course this represents only a portion of local indebtedness—the public debt of local authorities. The total, I imagine, including loans from private lenders, is not less than £250,000,000.

A great feature of modern municipal administration is the development of the funding system. Most large towns have their own stocks, and these, especially the larger ones, are rather popular securities. I do not think, however, that in the immediate future these will supersede State loans.

A second feature of connection and interdependence between central and local authorities I can only mention without illustration. Apart altogether from financial control, from the control which the creditor exercises over his security, there is, as you know, a normal authority and jurisdiction exercised by the Local Government Board in the departments of poor law and public health and some others; by the Lunacy and Fishery Boards in their own spheres; by the Education Department in the enormous and rapidly-increasing business of primary and some other forms of education; and by the Secretary for Scotland under a great variety of statutes. It is quite true that these central authorities cannot go beyond their statutory mandate. Thus, in the *Clydebank* case* a determination of the Secretary for Scotland as to proportional representation of a police burgh was set aside; in the *Port-Glasgow* case† an order by the Education Department as to the holding of school board elections was also set aside; and in the *Elgin* case‡ the court refused to give effect to the order of the Local Government Board in a question relating to water supply. But my point is that this right of interference and control is based, not so much on the possible ignorance or bad faith of local authorities, as on the manifest interest which the State, as a whole, has in the welfare of its parts, or at least in the harmonious and successful working of the local government machine.

What I wish, however, chiefly to direct your attention to to-night is the amount of imperial grant or subvention which is

---

* October 19, 1893, 21 R. 12. † March 10, 1892, 19 R. 594. ‡ 24 R. 512.

drawn by local authorities as part of their annual income. I stated the amount of assessments in Scotland for 1896 at £3,995,000, and the total receipts (exclusive of loans) at £9,166,000. The amount of imperial grants for the same year is £1,573,000. Of this sum burghs received £210,000 or 13·4; counties received £188,000 or 12·00; parish councils also received £188,000; and school boards received £981,000. These amounts represent a rate of 3·6d. for urban ratepayers; 3·4d. for rural ratepayers; and 11·2d. for parish ratepayers. The increase of these subventions has been extremely rapid. In 1886 the total amount for Scotland was only £679,577, as compared with £1,573,059 ten years later. The education vote, however, accounts for about £600,000 of that increase. Of this vote it is necessary to point out that £307,000 was a grant for relief of fees, £37,378 for secondary education, £592,788 for annual grants, and about £30,000 from the Science and Art Department. I will enumerate the subventions in their historical order under the various statutes authorising them.

Local Government Act, 1889, Sec. 22.

(New) £10,000—to the county councils in Highlands and Islands in proportion to old grants: to be applied in relief of local taxation as the county councils determine.

(Old) £35,000 for road authorities.
„ £155,000, pay and clothing of police in burghs and counties.
„ £20,000, pauper lunatics—medical relief and trained sick nursing in poorhouses.
„ £90,500—parochial boards: contribution to cost of maintenance of pauper lunatics.

Local Taxation Account (Customs and Excise) Act, 1890.

(New) £40,000 for police superannuation.
„ £15,000, medical officers and sanitary inspectors under Public Health Act.
About £18,000 between counties and burghs, according to valuation, for local rates, but with a discretion to apply to technical education.

Under these two Acts the fee grant for education to the amount of over £300,000 was established.

Education and Local Taxation Account Act, 1892.

£60,000, secondary education—inspection and examination. Secondary education in urban and rural districts.

£30,000, universities.

£25,000, pauper lunatics.

£50,000 among parochial boards (according to mixed ratio of valuation and population) in relief of local rates.

£100,000 among county councils and town councils (valuation and population) in relief of rates, *or* aid of expenses incurred under any statutory power, *or* scheme of public utility.

Agricultural Rates Act, 1896.

£183,381 (in 1898) in relief of occupiers' share of consolidated county rate and parochial rates on agricultural land.

A sum for the redemption of land-tax in burghs.

£15,000 for congested districts.

Residue of equivalent grant between parish councils and county councils.

Local Taxation Account Act, 1898.

£25,000 additional for police.

£15,000, vessels for marine superintendence for enforcement of Sea Fisheries.

£20,000 among parish councils and county councils to meet deficiency in agricultural rates.

£35,000, secondary, technical (including agricultural) instruction, &c., according to Minutes of Department.

The subventions paid to county councils direct from the Treasury and other departments out of votes, and not passing through the local taxation account, amount to £24,262, and refer chiefly to the maintenance of sheriff-court buildings, maintenance and removal of prisoners, and grants for public works and foot-paths in the Highlands.

For the year 1898 (31st March) the total payments to the local taxation account for the United Kingdom amounted to £9,402,310, of which Scotland received £980,329, to which sum must now be added something like £100,000 under the Act of

1898, giving a total of £1,000,000 on local taxation account, not including the direct education votes.

Now, before I refer to the source of these large payments, I wish to ask to what extent objection is raised against the policy which these figures represent? No doubt, the questions raised on the new Local Taxation Account are often discussed separately, but I cannot admit the propriety of this. The total sum received by School Boards in Scotland, being close on a million sterling, happens almost exactly to coincide with the amount received by Scotland generally through the Local Taxation Account. In discussing the relations of local and imperial finance it is impossible to disregard the largest item in the account. Much more than half the income required for carrying on the business of elementary education is derived from the central exchequer. And yet education, from its history, its intrinsic character, and the peculiar interest taken in it by the Scots, seems peculiarly suited for local independence. From the Reformation it has been a compulsory parochial service; it requires continuous local supervision; the local conditions vary greatly. Again, it is distinctly remunerative, the commodity is entirely consumed within the district, and the case for separate financial responsibility is therefore strong. But, although many people regretted the sacrifice of school fees as a source of local income, I am not aware that anybody has suggested a diminution in the education grants; and if that be so, I think it desirable that the general working theory adopted on this subject should harmonise with the existing practice under the Education Acts. Again, let me take two of the older subventions. For the last forty years the central exchequer has contributed one-half the cost of the pay and clothing of the constabulary, and an increasing sum for the maintenance of pauper lunatics and poor-law medical relief. The innumerable disputes about settlement show how keenly the principle of local responsibility for pauperism is recognised, but I have heard no suggestion that these subventions should be discontinued.

No doubt, however, it is on the new arrangements made during the last twelve years in connection with the local taxation account that the attack has been chiefly delivered. I mentioned that the total of that account for the year 1898 was £9,402,000 for the whole kingdom. It consists of the following items:— Additional beer and spirit duty (3d. per barrel of beer and 6d. per gallon of spirits), mainly excise but partly customs, amounting

to about £1,474,000; licenses, amounting to £3,699,790, of which the most considerable, in the order of amount, are those to publicans and grocers for the sale of spirits, the dog license, the carriage license, the game license, the beer, cider, and wine license, the male servants' license, the spirit dealers' license, the gun license, and many others. Then comes the share of the estate duty of 1894, which corresponds to the share of the probate duty handed over in 1890, amounting now to £2,560,000; and lastly, the share of estate duty payable under the Agricultural Rating Acts of 1896 for the relief of agricultural subjects, amounting to £1,667,000.

The classical text of the case against the Local Taxation Account is to be found in the series of papers published by Lord Farrer in 1890. He makes three points:—

I. The new subsidies are *dangerous and embarrassing* to the national exchequer. This does not apply to the largest item, license duties, because in that case the local authorities receive the whole of the particular branch of revenue collected locally. As regards the additional beer and spirit duty, no doubt it is only a small portion of a much larger tax, and it gives the local authorities a certain vested interest in this tax, and their consent would have to be negotiated for in the event of certain changes being proposed upon it. But during the nine years of the existence of this subvention it has not been found to embarrass the exchequer, and, notwithstanding the Irish demand for cheap whisky, the reduction of the beer and spirit duty does not seem at present to be within the contemplation of practical financiers. The same observation may be made with regard to the estate or probate duty. Lord Farrer's main argument there was that the interest given to local authorities in this tax would interpose another obstacle in the difficult task of reforming the death duties. But, as we all know, the death duties were safely reformed in 1894, and, so far as I am aware, the local authorities took no part in the discussion. Indeed, if subventions are to be made at all, it is not clear from what part of the national income, except the licenses, they could be made without provoking the somewhat unpractical comment just mentioned. A local income tax is repudiated on all hands. In 1871 Mr. Goschen proposed to use the inhabited house duty for this purpose, but his Rating and House Tax Bill was withdrawn.

II. Lord Farrer's second point is that these subsidies *fail to*

promote independent self-government. The local authority, he says, should have adequate sources of revenue, and should be responsible for its amount, its collection, and expenditure. The licenses are, no doubt, collected by the Inland Revenue Commissioners before being paid over to the local authorities, but this seems to be the merest detail of economy in administration. The local authorities certainly are not empowered to vary the licenses; they cannot remove the tax on dogs, or tax licensed grocers out of existence. The question whether they might not be entrusted with a certain discretion in this direction is extremely interesting, but it belongs to speculative politics, and has no connection with the present issue of independent self-government. The local authorities are equally powerless to raise or diminish the beer and spirit duty or the estate duty; in fact, these taxes are not local in their origin. But does it follow that to supply the local authorities of Scotland with an additional million of income does not promote self-government? Lord Farrer points out that the local authorities can do what they please with only a limited portion of the subventions. But this is not a new departure. The old exchequer grants survive so far as the compulsory application of the money is concerned; portions of the new subventions are dedicated to specific public purposes; another portion is dedicated to the relief of rates in town and country; and as to another portion the local authorities have a certain choice of application. But can it be doubted that the local authorities have a real responsibility in the matter? Take an old exchequer grant like that for pay and clothing of the police, which is given on a certificate of efficiency signed by an imperial officer. Can it be suggested that the standing committees are less alive to their responsibilities because they receive this grant? The Massey Lopes resolution of 1872 declared that the ratepayers should be relieved from the expense of the administration of justice, police, and lunatics, because the expenditure for these purposes was almost entirely independent of local control. This is an exaggeration, so far as Scotland is concerned, but to whatever extent well founded, it removes the foundation of Lord Farrer's argument. Take the education vote. Is there any indication that the School Boards in general recklessly add to their expenditure because they receive this vote? and in the rare cases of extravagance, is their policy not challenged by the ratepayers? Where a large balance of income is

provided by a rate, and where the ratepayers are inclined to watch so closely as they do in Scotland the results of the whole expenditure, I confess it seems to me that Lord Farrer's apprehensions are without foundation. He does not, indeed, go so far as to say that the new subventions have sapped the spirit of independence and the feeling of responsibility which we are accustomed to associate with our local authorities, but he says they have not tended to promote it. This suggests that, had other financial arrangements been made, independent self-government would have received a great stimulus. But, in order to maintain this thesis, it is necessary to table some specific and practical scheme of financial reform, not exposed to the objections above stated, and which might have been carried without raising too large issues and unduly prolonged discussion. It is obvious that the public business cannot stand still while the general theory of taxation is being examined. In fact, Lord Farrer's criticism is too much coloured by the principle, which he lays down in the most rigorous form, that imperial finance must be completely separated from local finance; that no claim by local authorities should be recognised by the national exchequer; that the whole burden, responsibility, and benefit must rest on the same local shoulders. It seems to me, on the other hand, impossible to completely localise benefit and responsibility, so that there is *prima facie* a case for some extension or diffusion of burden. I should have thought, accordingly, that in order to do full justice to taxpayer and ratepayer alike, it was necessary to consider imperial and local finance together, and probably to use the one for the purpose of correcting the defects of the other. And there is a good deal of authority in favour of that view. Professor Bastable (Public Finance, 376), after reviewing the possible sources of local taxation, says: —"After all these expedients have been carried as far as circumstances will allow, it may be necessary to adjust the balance between the central and local governments by a transfer of the funds of the former, or by the employment of its taxes as a base on which to raise additional local resources. Most financial systems have adopted one or both of these expedients." I agree with Professor Bastable in repudiating the doctrine stated by M. Leroy Beaulieu, under which local taxation in the form of *centimes additionels* becomes a mere appendage to general taxation. That may suit an over-centralised country like France,

but the better-considered schemes of Belgium, Germany, and Austria apparently support the general principle of the recent changes in this country. Various shares of customs duties, excise duties, and postal receipts have been transferred.

III. Lord Farrer's third point is that the distribution of the new subventions is unjust, chiefly as between town and country, between the urban occupier and the ratepayers in rural districts, between different interests in land. Twenty-eight years ago Parliament declared that it was the duty of Government to enquire into the incidence of imperial as well as local taxation, and to take such steps as shall insure that every description of property shall equitably contribute to the national burdens. When this principle came to be applied in the equalisation of the death duties, it was urged with still greater force that if real estate now fulfilled its obligations to the national exchequer, personal estate should do likewise to the local authority. But that is not Lord Farrer's position. He says:—"The real controversy, especially in towns, where the burden is heaviest, is not between land and personalty, but between the occupier or temporary tenant of capitalised real property and the owner of that property." Now, it is true that it was Mr. Goschen's opinion, expressed in his Report of 1871, that the rates should be equally divided between occupier and owner, partly that the burden might be shared, and partly that the owner might become directly interested in local administration; and this reform has never been carried out in England. In fact economists have never been able to determine under what circumstances and to what extent the owner or the occupier pays the rate. I think the latest contribution to the subject was a pamphlet by Mr. A. D. Macbeth, of Rothesay, which appeared in the *Scottish Accountant* in 1897. Probably, in towns the occupier does ultimately pay a considerable proportion of the rate, but, however that may be, there can be no objection to the extension to England of the Scottish system of a division of rates, which tends to equalise burden and has been in operation for half a century. The existence of this system blunts the point of Lord Farrer's criticism, so far as applied to Scotland. As matter of fact, what, I believe, economists call the percussion, or first incidence, of local taxation in Scotland stands as follows:—Ownership, £1,618,000; occupancy, £2,376,000. The poor and

school rates are equally divided, £790,000 paid by owner and the same amount by occupier. The county council rates are paid—£415,000 by owners and £270,000 by occupiers, the difference here being largely accounted for by the road rate. In burghs, on the other hand, the owners pay £366,000, and the occupiers £1,315,000, the main items being for watching, lighting, cleaning, water supply, and maintenance of streets, in which occupiers are more immediately interested than owners. I have already mentioned that, taking, *e.g.*, the period 1848 to 1893, while what are called non-remunerative rates in the Scottish burghs had increased only 147 per cent., the remunerative rates had increased from £147,000 to £1,850,000 or 1,357 per cent. In counties, on the other hand, the increase in remunerative rates had been only from £206,000 to £869,000, or less than 400 per cent. Some burghs, I believe, are taking powers to impose directly a larger proportion of their assessments upon the owners of property, but on the whole it cannot be said that the question of owner and occupier is burning in Scotland, even in the larger towns. Nor has any very serious complaint been made of the ratios in which the recent subventions have been divided between town and country.

The substance then of the local taxation account, so far as it affects Scotland, is that monies raised from the taxation of beer and whisky, from the licenses enumerated, and from the death duties, are applied partly in the relief of rates, partly in the specific objects which have been mentioned above (but subject to a considerable discretion in the local authorities), and largely for payment of school fees and in promotion of the higher instruction. Now, I have always understood that at all events one main reason urged for the recent grants (so far, at least, as applicable in relief of rates) was that real property ought not to bear the whole burden of local taxation, and that, in particular, it had been established by the Report of the Royal Commission on Agriculture that the pressure of local taxation on agricultural subjects was exceptionally severe. It is perhaps unnecessary to argue the first of these questions in Scotland, where the ancient and customary principle of assessing local burdens had reference to means and substance, or ability to pay. I think Lord Chancellor Campbell was once asked to pay rates in Roxburgh on his official income. The practical exigencies of administration restricted the assessment to real property (excluding machinery,

included in England), but the commonsense of the country endeavoured to correct this injustice by a system of classification based on some vague relation between income and the character of the subject on which rent was paid. This system equally admitted the second proposition that agricultural land was exceptionally taxed. The burgh police legislation of 1862 and 1892 provided that agricultural land within burghs should be rated at a fourth of its value, and the Rating Act of 1896 gave relief to the extent of five-eighths, instead of three-fourths, in rural districts as well, thus extending the system of classification. It was impossible to defend the theory that the farmer should pay on his farm rent in the same proportion as the tenant of a dwelling-house on his house rent. In order to reach ability to pay you would have to divide in the one case and multiply in the other. It being assumed that relief cannot be obtained by the local assessment of property other than real estate, the alternative seems to be a grant from the imperial exchequer. From what sources is that grant derived? The fair answer to that question is that it is taken from the general imperial income, which again is derived from a great variety of sources, but only to a relatively small extent from either the income or the capital value of real estate. To relieve local taxation out of general income would appear, therefore, to be a real and not an apparent relief. But particular sources of imperial income have been indicated as available for the purposes of this relief. The grant in aid of the agricultural rate in Scotland is declared to be a charge on the estate duty derived from personal estate in Scotland. The only importance of that declaration seems to be that it suggests a source of, and also a limit to, further relief. For example, an increase or decrease in the other branches of the public revenue would not present any case for alteration on the amount of this grant. But in effect, of course, the grant, though limited in expression to duty on personal estate, is a charge upon the whole income; it leaves a smaller balance for other purposes. I will not attempt to discuss the incidence of estate duty, but the view is taken that the duty is so small a percentage of the annual income that it is not exposed to the objections of a tax on capital. As to the licenses handed over to local authorities, it has been calculated that a little more than two-fifths belong to taxes levied on the consumption of luxuries by the wealthier classes, while the remaining three-fifths

may be described as industrial taxation. It is, I believe, impossible to state in what proportions such a license duty is paid by the person carrying on the industry and the person who consumes the commodity produced; I presume the general tendency is to transfer all expenses of production to the shoulders of the consumer, but, with our international markets, it is obvious that this can by no means be universally true. Even as regards the third source of the grants, the beer and spirit duties, it has, I think, been pointed out by high authority that, while no doubt in the main and on the whole, excise duties will be paid by the consumer, it is by no means clear "how far the abolition of the excise would (*a*) increase the profits of brewers and distillers as well as retail traders, (*b*) allow of higher prices for barley, hops, sugar, and other similar materials, or (*c*) cause a lowering of wages in consequence of the smaller outlay on drink by labourer and artisan" (Bastable, p. 510). I may be excused from attempting to trace further the diffusion of these particular forms of taxation: the problem seems still to be in a very fluid condition.

I wish, however, to notice the vigorous attack made on the finance I have been describing by the late Dr. W. A. Hunter. This is contained in a paper in the "Contemporary Review" for 1893, bearing the attractive title of "A Story of Crooked Finance." Dr. Hunter obtained a most interesting return, from which it appeared that there were in Scotland 2,767,664 working men occupying houses with a rental under £10; 433,247 working men and lower middle classes occupying with rentals between £10 and £15; and 252,041 of lower middle classes occupying with rentals from £15 to £20. It scarcely needed such a return to show that the benefit of a grant in relief of local taxation would go mainly to those who paid large rates on high rentals, and to a comparatively small extent to the classes mentioned above, whose rates are small. Dr. Hunter put it that in the four chief towns $\frac{12}{16}$ of the occupiers of dwelling-houses paid about $\frac{1}{16}$ of the poor rate, and of course the relief afforded to them was in proportion. But when he goes on to state that the effect of the system of imperial subvention is to transfer £7,000,000 from the working classes to the rich ratepayers I am unable to follow him. What he suggests is that, if the money spent in relief of rates were spent in remission of taxes, in repealing the duty on tea and coffee, and in reducing

the tax on tobacco from 3s. 6d. to 8d. per lb., the working classes would benefit to the extent mentioned; and he adds that, if all indirect taxation, except the duties on alcoholic liquors, were abolished, the working classes would still pay an excessive and disproportionate share of imperial taxation. I am far from denying that large speculative questions may be raised as to the abstract justice of the present relations between direct and indirect taxation. But when, so far as financial authorities are concerned, there is not even a trace of movement for the further abolition of customs duties, it appears to me that these considerations are scarcely relevant to the question of the relief of local taxation. The kind and degree of injustice or inequality in that system, which the subventions are intended partly to remove, are different from those denounced by Dr. Hunter, and they occur as part of a system under which the national finance must proceed for some considerable time to come. Taking the public revenue as at present collected, to one-half of it the working classes make no direct contribution at all; and, therefore, the imperial subvention to the extent of one-half comes from a fund in which they are not interested. As regards the 49 or 50 millions collected from customs and excise, it is impossible to say with any approach to accuracy in what proportion the £10 householder contributes. He may, if he pleases, contribute nothing at all. It is highly improbable that, if temperate in his habits, he contributes so much as 35s. per annum. It is quite certain that he pays for his country a much smaller percentage on his income than any of the classes whom Dr. Hunter would describe as even moderately wealthy. I see nothing wrong in this, because it is only another way of stating that in questions of taxation a certain allowance should be made for the minimum cost of living. But looking to the optional character of the greater part of indirect taxation (perhaps tea, coffee, and cocoa should be regarded as necessaries of life), I cannot see how any great reduction can be made without arriving at the practical exemption of the working classes, a result which on political and social grounds I should deplore. At all events, the expediency, if not the equity, of such a change is doubtful, and the mere future possibility of it does not appear to me to warrant Dr. Hunter's statement that the money paid in imperial subventions is "dexterously extracted from the pockets of the most numerous and least wealthy class."

I may say that, while I think some of the attacks on recent financial policy have been unfounded or exaggerated, I warmly support the development of local self-government. I am unable to decide whether the ideal form of that government ought to be wholly separated from the Central State in administrative power and financial responsibility. That is a question which must receive different answers at different times, and even at the same time in different parts of any particular State. Glasgow can perform with success what Auchtermuchty is unable to attempt. All I submit is that the recent imperial subventions appear to be an honest attempt to rectify an inequality in existing arrangements, and they do not appear to me to have compromised, or in any way affected, the independence or efficiency of Local Authorities involved.

VII.—*On the Different Instabilities of Convex Bodies spinning in different directions on a Plane, first discovered in Celts.* By MAGNUS MACLEAN, M.A., D.Sc., F.R.S.E.

[Read before the Society, 8th March, 1899.]

CELTS are stone implements in the form of chisels, or adzes, or hatchets, which were in use during the Neolithic period. The name is probably derived from an obsolete Latin word, *celtis*, meaning a chisel, and is akin to the Welsh word *cellt* (modern, *callestr*) meaning a flint.

The materials of which they were formed were rocks of some kind, but the most common rocks were flint, clay-slate, quartzite, and various kinds of greenstone and metamorphic rocks.

The general form of celts was a flat blade of oval section, with one end broader and sharper than the other, and the sides sharp, flat, or rounded.

Sir John Evans in his book, "The Ancient Stone Implements of Great Britain," devotes four chapters to the subject of celts. He discusses them under three heads:—

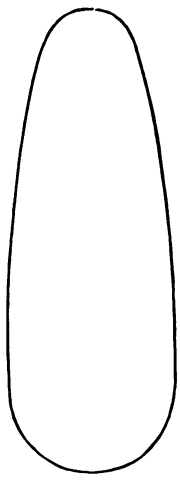
1. Those merely chipped out in a more or less careful manner, and not ground or polished;
2. Those which, after being fashioned by chipping, have been ground or polished at the edge only; and
3. Those which are more or less ground or polished, not only at the edge but over the whole surface.

The polished celts he subdivides into four classes, in accordance with the section presented by the middle of the blade:—

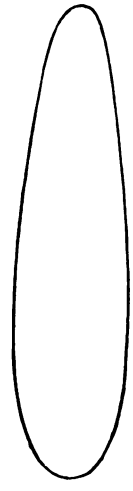
1. Those sharp or but slightly rounded at the sides, and presenting a pointed oval, or *vesica piscis*, in section;
2. Those with flat sides;
3. Those with an oval section; and
4. Those presenting abnormal peculiarities.

This evening I wish to draw your attention to a peculiar property possessed by a large number of polished celts. The property to which I refer is that many stone celts will rotate steadily in one direction on a smooth surface, but that they will not rotate steadily in the opposite direction. I wish also to give you, very briefly and without any mathematical analysis, the dynamics of such motion.

My attention was first drawn to this subject more than three years ago by Rev. Dr. Joass, Golspie, who sent me a plaster cast* of a celt in the Museum at Dunrobin, and which has the property



(Fig. 1.)



(Fig. 2.)

of rotating steadily when spun right-handedly,† but when spun left-handedly it wobbles, stops, and rotates for a short space right-handedly. The specimen was found in a cairn containing a "short cist," at Crakaig, in Loth, twelve miles to the north-east of Golspie. (Experiment shown.)

Accompanying the plaster cast was a wooden model made by Robert B. Sangster, Esq., Rovie, Rogart, which, by fixing the movable piece of wood with lead weights (*A B* in Fig. 3) in certain definite positions, can be made to rotate steadily in both directions, or can be made to rotate steadily in the right-hand direction, but not in the left-hand direction, or *vice versa*.

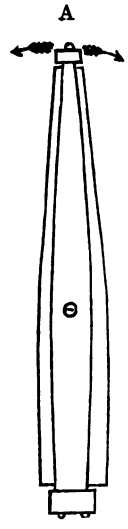
For example, when the wooden model is as shown in Fig. 3 it will rotate steadily in either direction; when in the position Fig.

---

* Two outlines of this cast are given in Fig. 1 and Fig. 2, one with the broadest face full on, and the other at about an angle of 45° to the broadest face. Dr. Joass kindly sent the real celt in time to be shown at the meeting of the Society on 8th March.

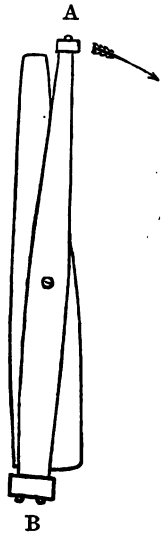
† What is called right-handed rotation is rotation with the hands of a watch to a person looking down on the celt.

4 it will rotate steadily in the right-hand direction, but not in the left-hand direction; and when in the position Fig. 5 it will

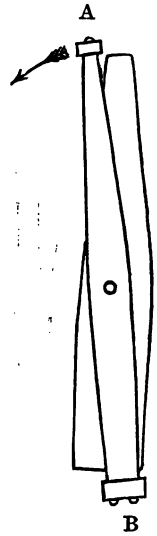


(Fig. 3.)

rotate steadily in the left-hand direction, but not in the right-hand direction. (Experiments shown.)



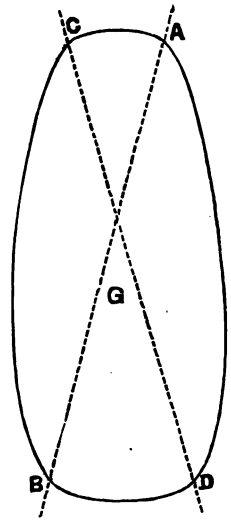
(Fig. 4.)



(Fig. 5.)

Mr. Sangster writes me as follows regarding the model:—"The model I made was a somewhat hasty construction intended to illustrate to Dr. Joass, Golspie, my idea of the peculiarity of the one-direction rotation of celts. Dr. Joass had explained to me the manner in which the ancient Celts had ground their axes. It appears that when the operator was a right-handed man the celt rotates smoothly to the right only; a celt made by a left-handed man rotating smoothly to the left only. The celt was held in the palm of the hand and rubbed longitudinally on a fixed grindstone, the motion of the hand being a push-and-pull one. Dr. Joass tells me these grindstones have been found, and that they show the groove made by the friction.

"Well, if you examine one face of a celt you will see the highest ridge running diagonally, as *A B* in Fig. 6, instead of longitudi-



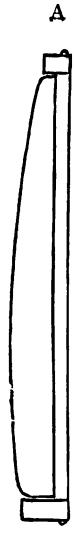
(Fig. 6.)

nally in the middle. The highest ridge on the other face also runs diagonally, but from the opposite corners, as *C D*. In the plan the two diagonals intersect nearer to the narrow end, and therefore well away from the centre of gravity, *G*. The centre of gravity is directly above the point of support of the celt when it is at rest on a horizontal plane; but that point of support is to one side of the highest ridge or keel. In constructing the model I endeavoured first to make the body of it so that it would rotate smoothly in

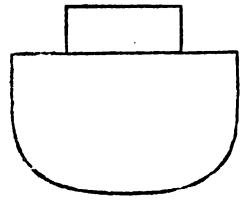
either direction, and then to add a movable piece of wood, fixed at the position where the diagonals in the real celt intersect, to represent the other face. What was done, in effect, was simply to make provision for the movement of the centre of gravity of the system to one side or the other of the central highest ridge or keel, and a much simpler weighting arrangement would have answered equally well, though perhaps not so good for illustration."

A principal axis through the centre of inertia of a rigid body is such that when the body is rotated round this axis the centrifugal forces are balanced. For every rigid body it is possible to find three principal axes mutually at right angles to one another. In general —except, for example, a sphere or a cube—the moment of inertia round one axis is a maximum, and round another axis a minimum, and round the third axis a minimax. In the celt shown the moment of inertia round a vertical axis through the centre of inertia is the greatest, and the moment of inertia round a longitudinal axis through the centre of inertia is the least. The moment of inertia round a transverse axis through the centre of inertia is less than the moment of inertia round the vertical axis, and is considerably greater than the moment of inertia round the longitudinal principal axis. The transverse axis is an axis of minimax moment of inertia.

At the point of support of the celt there is a minimum curvature and a maximum curvature, the former longitudinal and the latter transverse, as shown in Fig. 7 and Fig. 8. If, as



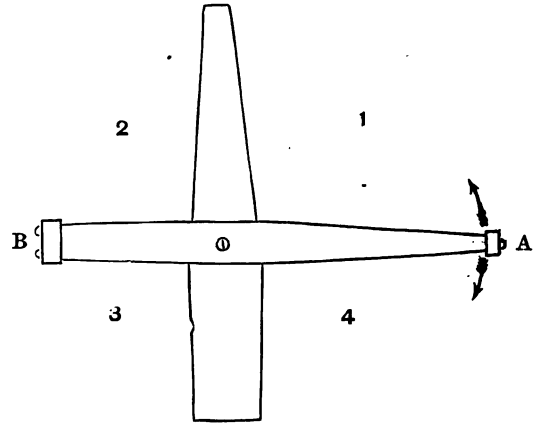
(Fig. 7.)



(Fig. 8.)

in an ellipsoid, the vertical plane through the principal axis of least moment of inertia coincide with the vertical plane containing the point of support and the line of minimum curvature, then rotation is steady in either direction round a vertical axis through the point of support. But if, as in the celt shown, the vertical plane through the principal axis of least moment of inertia is to the right of the vertical plane through the point of support and the line of least curvature, the celt will rotate steadily in the right-hand direction, but not in the left-hand direction. This is clearly shown by the model, for by turning *A B* to the right, as in Fig. 4, thus shifting the principal axis of least moment of inertia to the right, or so that the principal axis of least moment of inertia makes an angle less than 90° with the plane of maximum curvature, the model rotates steadily to the right, but not to the left. Similarly, by shifting *A B* to the left, as in Fig. 5, the model will rotate steadily to the left, but not to the right.

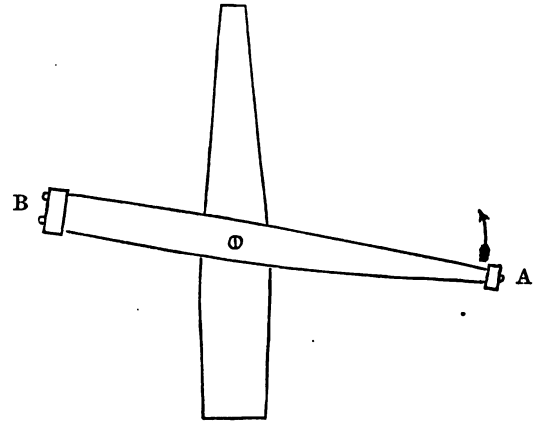
Again, shift *A B* to the right till it is as in Fig. 9. Now the



(Fig. 9.)

vertical plane through the axis of least moment of inertia coincides with the plane of maximum curvature, and the body will rotate steadily in either direction, just as it did when the vertical plane through the principal axis of least moment of inertia coincided with the plane of least curvature. Turn *A B* still further to the right, as shown in Fig. 10, then the model will rotate steadily in the left-hand direction, but not in the right-hand direction.

Hence if A be in quadrant 1 or 3 of Fig. 9, the model will rotate steadily in the right-hand direction; and if A be in quadrant 2 or 4, the model will rotate steadily in the left-hand direction.



(Fig. 10.)

The dynamics of the motion may be shortly put as follows:—

There must be two different curvatures at the point of support —a maximum and a minimum.

If the vertical plane through the principal axis of least moment of inertia coincide either with the plane of least curvature or with the plane of maximum curvature, then rotation is steady in either direction round a vertical axis through the point of support.

If the angle between the vertical plane through the principal axis of least moment of inertia and the plane of maximum curvature be less than 90°, then rotation is steady round a vertical axis through the point of support, when the direction of rotation is from the principal axis of least moment of inertia to the plane of maximum curvature round the angle, which is less than 90°.

Through the kindness of Professor Young five specimen celts from the Hunterian Museum of Glasgow University were also shown. One of them, made of argillaceous or fine clay rock, would spin steadily in the left-hand direction, but wobbled when spun in the right-hand direction.

Another large specimen* found at Braehead, and made of fine-

* Length, 36 cms.; breadth, 8 cms.; depth, 5·5 cms.; weight, 2·18 kilogrammes.

grained silicious rock, rotated steadily to the right and not to the left on one face, but rotated steadily to the left and not to the right when spun on the other face.

The other three specimens, of a much smaller size and also made of fine-grained silicious rock, rotated steadily to the left and not to the right.

At the meeting of the British Association at Ipswich in 1895, Mr. G. T. Walker, M.A., B.Sc., Fellow of Trinity College, Cambridge, showed a top of his own construction to illustrate this rotational and non-rotational property of smooth celts. The top consisted of a much-flattened ellipsoid, with a circular disc cut in its centre which could be rotated round a vertical axis. The vertical axis carried a heavy nut. The object of the heavy nut was to modify the height of the centre of gravity of the whole. The object of the rotating central disc was to alter the direction of least curvature from coincidence with the principal axis of least moment of inertia. The top could be made to rotate steadily in one direction, but not in the other, by rotating the disc into different positions, and raising or lowering the heavy nut on the vertical axis. The paper, which contains a full mathematical analysis of the motion, is printed in *The Quarterly Journal of Pure and Applied Mathematics*, vol. 28, pages 175 to 184.

VIII.—*Better Houses for the Poor—will they pay?*

By JOHN MANN, Jun., M.A., C.A.

[Read before the Society, 14th December, 1898. A Communication from the Economic Science Section.]

I.—PROBLEM—HOUSING THE STRUGGLING POOR.

I SHALL not detain you with any attempt to depict the actual conditions of life amongst the poor. To excite interest, one should perhaps be dramatic, and set forth startling and picturesque details. I could easily occupy all the time at my disposal with descriptions, drawn from many years' experience acquired in the management of slum property, in the examination of decayed and ruinous buildings ripe for demolition or renovation, and in visiting "ticketed" houses, both by day and with the sanitary officials on their night inspections.[1] But I assume that your interest in the subject does not require to be aroused by any such descriptions, I shall risk failure to bring home to you the real nature of the ills to be remedied, and refrain from picturing the pitiful and sordid conditions of life in such houses, where quietness and peace never dwell, where the senses of sight and hearing are continually offended, and where decency is often well nigh impossible. I always come away from these districts with an aching heart.

What is happening in Glasgow is this—sanitary science is advancing, the standard of overcrowding has been raised, uninhabitable houses are being condemned;[2] while the railway

[1] By the Glasgow Police Acts, any house which does not exceed three rooms may be measured by the Sanitary Inspector, and if its total cubic capacity does not exceed 2,000 cubic feet, a small metal ticket may be fixed on the door. On this ticket is marked the total cubic contents, and the legal number of inmates at the rate of 400 cubic feet per adult or child aged ten years or upwards. A system of night inspection is maintained over these houses, and cases of overcrowding are prosecuted. So far as I can learn, no other city adopts this precaution except New York, where the legal minimum air space is 600 cubic feet (Tenement House Act, 1879), and where night inspection of all "tenement houses" by the "Sanitary Police" has been enforced since 1895.

[2] The total number of "ticketed" houses of one and two rooms has been reduced by over 2,000 during the last ten years, viz., from 23,288 in 1887 to 21,229 in 1898.

companies and the Improvement Trust are again clearing away overcrowded and congested districts inhabited by the poorest of the poor. These people are being driven closer and closer into the remaining slums, causing the rents to be raised, whilst dragging down the reputation both of their new houses and new neighbours. Just as the Saltmarket waifs were driven over the river into Gorbals, and up to Cowcaddens, Garscube Road, and Garngad, and dragged these districts down, so the present clearances will affect new places. The raising of the rents forces up the value of the remaining slums, and makes them more difficult to deal with. The present method should be reversed, and building precede demolition.

How impossible it is for these dispossessed people to find house room in the new buildings being now erected in such large numbers in Glasgow is proved by the fact that the average rents of new one and two-roomed houses are not far from double the rents of the old "ticketed" houses (see Table III. *infra*). No, the struggling poor—the inhabitants of the "ticketed" houses—are still unprovided for. Private builders leave them severely alone. Owing to their dirty and destructive habits, the heavy expense of closely detailed management and supervision (their year's rent being paid in, say, fifty weekly instalments), combined with their inability or unwillingness to pay adequate rents, the financial results are far too precarious to suit the ordinary builder. Besides, suitable sites, if to be had at all, are dear; wages and materials are at high levels. These obstacles of heavy initial cost and heavy management are intensified by the necessary restrictions of the Building Regulations Act.

Yet these wretched people must be rehoused somehow, if not from motives of humanity, then from the necessity of self-defence. Their houses, habitually overcrowded and abused, are plague spots, centres of infectious disease, and a source of great danger to the community.

Let us think for a moment *who are being dislodged*, and what kind of people require rehousing. We may at once leave aside the well-doing artizan, earning 25s. to 35s. a week. He is provided for by private enterprise. He can fight for himself. He has an income almost equal to that of the "lower middle class," as it has been called; but he does not, like them, require to "keep up appearances." We must confine ourselves to those distinctly lower in the social scale—to the inhabitants of the slums, who, to a casual

observer, are all sordid and degraded, so rampant are vice and crime, thriftlessness, dirt, and drunkenness. But it is a mistake to denounce, without qualification, the improvidence and profligacy of the masses. The slums contain a strain of goodness and purity; there is leaven in the lump.

There are broadly, therefore, two classes below the skilled artizan: *first*, the industrious, but poor, folk, really very poor, with low earnings, but reputable and decent—each *household*, through depression of trade, irregularity of work, illness, and inefficiency, earning on the average about 20s. per week; and, *second*, the ill-doers, disreputable, vicious, and criminal, often earning over 20s. a week, aye, double 20s. a week, but lazy, drunken, and improvident, destructive and disorderly in their habits, quite able to afford fairly high rents, but making the gratification of their animal instincts the first consideration, while building up a home where their children can be reared in health and decency never seems to cause them a thought. Included in this class are the habitual offender, the vagrant, and the beggar. The ever-recurring difficulty, of course, is to tell whether an individual case belongs to one class or to the other; they are constantly merging into each other, though, unfortunately, the tendency is generally downwards. Especially pitiful is it to see the children of industrious parents dragged down by their environment into disreputable and improvident habits.

It is simple madness to think of erecting *ordinary* model dwellings for all the members of these two classes; undoubtedly the first step is to try to separate the good and the bad. The industrious and the lazy, the provident and the improvident, the sober and the drunken, must be treated differently. But I contend that for *both* classes wholesome houses, constructed and managed on suitable lines, should be available *at low rents*, and *near the different centres* of the city. At low rents, because, although skilled workers and artizans expend perhaps not more than one-eighth or one-tenth of their income in rent, the struggling class are often compelled to lay aside even a fifth of their weekly wages to pay the rent, and the disproportion between rent and wages tends to increase in intensity.[3]

---

[3] The evidence led before the Royal Commission on the Housing of the Working Classes in 1884 went to show that in certain poor districts in London 88 per cent. of the poor pay more than one-fifth of their income as

And such houses must be near the various centres of the city, near the railways, near the docks. Not only must the casual labourers and the poorer artizans live near their work, but the earnings of the head of the house are too often insufficient, and a large proportion of each household in the slums is at work. The women and girls cannot go far. They must be out early in the dark mornings, or they must carry their home-work to the warehouses.

This, then, is the real problem, will it pay to provide this class, whether reputable or disreputable, with better houses—either by the construction of new dwellings, or by the restoration of old, dilapidated buildings? If it pays in pounds, shillings, and pence, it will indeed be an investment twice blessed.

II.—Some Housing Experiments (New York, London, Edinburgh).

Now, for some years past I have been collecting data upon this question, obtained from many quarters—from the Continent and

---

rent (46 per cent. pay one-fourth to a half, 42 per cent. from one-fourth to a fifth), while only 12 per cent. pay less than one-fifth.

As the result of recent inquiry by Mr. Peter Fyfe, Glasgow Sanitary Inspector, the ratio of rent to earnings among the inmates of the ticketed houses was only about one-tenth, but the average of earnings is disturbed by the inclusion of tradesmen and artizans living in such houses, though earning 30s. to 66s. per week, and therefore quite able to afford much higher rents. (Lecture to the Glasgow Architectural Craftsmen's Society.)

"Attention was first called to the relation between income and the outlay for rent by Dr. Schwabe, Chief of the Municipal Statistical Bureau in Berlin, in the year 1867. He formulated the following 'social law' with respect to such payments:—'The smaller the income, the greater is the proportion which is expended for rent.' Dr. Engel, of the Royal Prussian Bureau, extended this later to all expenditure for the necessaries of life. According to Dr. Schwabe a family with an income of £135 spends 20 per cent. of this for the rent. Engel places this outlay at 12 per cent. Investigations by Dr. E. R. L. Gould in the United States and Europe substantiate this latter figure. According to his investigation, from 10 per cent. to 12·5 per cent. in Europe, and in the United States from 12 per cent. to 16·9 per cent. of the average income, is expended for rent by working men in the coal, iron, and steel industries. In Maine, for families with an average income of £140, the proportion which goes for rent is 15·4 per cent.; in Massachusetts, for families with an average income of £130, the rent amounts to 15·5 per cent.; where the income averages £170 the rent averages 14 per cent. of it."—"Housing of Working People in Yonkers, U.S.A.," by Dr. E. L. Bogart. The Macmillan Co., New York, 1898, pp. 342, 343.

the United States, as well as England—but the results, I must confess, are puzzling, and hard to analyse, partly owing to the method of their statement, and very often to the meagreness of the information accompanying them. After all, the most of the data applies to houses for what might be called the "upper lower" class. We have little or no data as to the housing of the lowest class. For instance, the two International Congresses which were held in Paris and in Brussels on the question of cheap houses,[4] were largely occupied in discussing schemes for enabling the working man to become his own landlord, a goal from which the very poor are indeed far removed.

Take, again, New York. Three years ago a Committee of the New York Legislature, called the Tenement House Committee,[5] submitted a most interesting and elaborate report, from which also we have little to learn. *Inter alia*, the Committee report that, "when properly managed, good dwellings pay fair profits to their owners." But, so far as I can trace, there is only one experiment recorded by the Committee regarding houses for "very poor people," and that is said to pay "a little more than 3 per cent."[5a]

The Riverside Buildings pay 6 per cent., but they were erected between 1876 and 1890, and are for a good class of tenant. The Tenement House Buildings Company, Cherry Street, in 1891, paid $4\frac{3}{4}$ per cent.; it now pays 4 per cent. New York Improved Dwellings Company pays 5 per cent. regularly, but we find that it bought its land years ago very cheaply, and could now sell at double its cost (pp. 121 and 492); in other words, the experiment could not now be so successfully repeated. Of the tenants of the New York Company, 60 per cent. are said to be mechanics, artizans, shopmen, &c., while 40 per cent. are classed as day labourers, and it is added that the statistics show a "lower average of proportionate income than is shown by the model tenements of London." But the average of London model tenements is high.

Many of the large London Model Dwellings Companies do not profess to deal with the humble labourer at all, and are really commercial undertakings, although some of them have enjoyed

---

[4] *Actes du Congrès International des Habitations à Bon Marché.* Brussels, 1897.

[5] Report of the Tenement House Committee, New York, January, 1895.

[5a] Cherry Street Buildings of the Riverside Company.—Tenement House Committee Report, p. 386.

special advantages in the way of gifts of cheap ground.[6] The rates of dividend they pay are therefore not always a sound answer to my question. The Royal Commission on the Housing of the Poor reported in 1884 that "the model dwellings do not reach the class whose need is the greatest . . . they have not relieved the class for whose benefit they were intended" (p. 89). The Trustees of the Peabody Donation Fund, for instance, restrict their tenants to the respectable settled class, many of whom are quite able to afford higher rents.[7] The average wages of the *head* of each household in the Peabody Buildings is reported as 23s. 2½d. per week, but the earnings of the other members of the household have to be added to this to get a fair idea of the tenant's position. On the other hand, the average weekly earnings of *each household* in the buildings erected in London by the Trust formed in 1889 by Sir E. C. Guinness (now Lord Iveagh) are, so far as can be ascertained, 19s. 6¾d., while in the Cathedral Court property of the Glasgow Workmen's Dwellings Company, Limited, they are 19s. 4¾d. in two-roomed houses.[8]

I am inclined to think that, whether from its method of construction, details of accommodation, or system of management, the Guinness Trust in London is one of the most successful amongst the few agencies attempting to house the respectable struggling poor. Its scale of rental is fixed on the basis of paying interest at 3 per cent., and a sinking fund of ½ per cent., and this result has so far been achieved. It is unique in an arrangement by which hot water is provided for all tenants, free of cost, from a tap in each court, at all times; and, in addition, at meal times small quantities of boiling water can be obtained from the caretaker of the buildings. I am assured that these

---

[6] For example, the blocks near the Marble Arch erected by the Improved Industrial Dwellings Company, Limited, on ground leased by the Duke of Westminster at only 30s. per square yard; also the Portman Street buildings of the Artizans', Labourers', and General Dwellings Company, leased from the Duke of Portland at a nominal rent.

[7] The rents of 3,600 out of the 5,100 houses in the Peabody Buildings were raised in January, 1899, about 4d. per week per tenant on the average—largely, it is said, to meet increased taxation. In the opinion of the Secretary "all the rooms were underlet."

[8] As the result of Mr. Fyfe's recent inquiry, it is found that the average earnings of the tenants of the Glasgow ticketed houses are:—One room, 20s. 6¾d.; two rooms, 26s. 5½d. per week; but these averages are inflated, as explained in Note 3.

privileges are highly esteemed. With us fires are kept more constantly burning than in London, owing to our colder weather and cheaper coal, but I would much like to see a similar experiment tried here.

Another London company which has been equally successful is the East End Dwellings Company, Limited, formed about 16 years ago, and latterly paying 5 per cent. on £100,000 of ordinary shares—partly owing to having loans at 3½ per cent., and £50,000 in preference shares at 4 per cent. It has a reserve of £10,000. Through the courtesy of the Secretary of this Company and the Secretary of the Guinness Trust I have been able to give various details of certain representative blocks (see Tables Nos. II., IV., and V.). I am sorry I have failed to obtain in similar detail the results of the Four Per Cent. Industrial Dwellings Company, Limited, London, and the South London Dwellings Company, Limited (the latter managed by Miss Cons, long an associate of Miss Octavia Hill), both of which pay 4 per cent. regularly. These two companies, from what I have seen of their buildings, seem to reach the same class as the Guinness Trust and East End Dwellings Company, but, with these exceptions, I do not think that the results of London companies help us.

The Corporation of Edinburgh has recently erected two large blocks of workmen's dwellings at High School Yards, in Cowgate, where a congested area has been cleared and rebuilt, and at Tynecastle, in the extreme west, on ground valued at only 5s. per yard. The management of this property has been entrusted to the Edinburgh Social Union, and it is claimed that they have been largely successful in obtaining tenants from the classes dispossessed by clearances. These buildings have been so recently completed that it is too soon to deal with the financial results. The figures given in Tables II., III., IV., and V. below have been kindly supplied by the officials of the Corporation, and, so far as the return on capital is concerned, are, I understand, rather the expected than the actual result. Time does not admit of more than mentioning other most interesting steps in the right direction in Edinburgh—for instance, the work of St. Giles Dwellings Company, the Rosemount Association, the buildings at Water of Leith, erected by the late Mr. Finlay, and new tenements at Pleasaunce, just erected by the North British Railway Company. The work of improving and renovating old buildings has been extensively and successfully

undertaken, on the lines of Miss Octavia Hill's work, by the Social Union.

We need not yet look to the London County Council for light on the subject. I have carefully examined the accounts of its Committee on Housing, but with much disappointment. They now admit that they have hitherto found it impossible to provide low-rented houses, owing to the high standard of accommodation required by the Home Secretary and the Local Government Board, to whom their plans are submitted. For instance, the "Boundary Street Area," in the east of London, was a plague spot, both as regards disease and crime, and, having been cleared by the Council, was rebuilt, with the avowed intention of housing those dispossessed. But, with the exception of one block (which contains 15 one-roomed houses at 3s. 6d. per week), no house is let at less than 5s. 6d. per week, including, as in all London houses, all taxes, while, on the other hand, the average weekly rents per room, including taxes, in the East End Dwellings Company and Guinness Trust Buildings are 2s. and 2s. 1½d. respectively. When I visited Boundary Street Area, I saw some well-dressed ladies arriving on bicycles. I took them at first to be friendly visitors of the poor tenants, but my conductor informed me, with a grin, that they were tenants themselves, and added that, so far as he knew, not one of the old tenants dispossessed by the clearances had been rehoused by the Council. The results are that the Council have simply entered into the building market, ousted the degraded tenants into other, and probably no better, shelters, and then found that they dare not let the old tenants take possession of the new buildings.

III.—Glasgow Improvement Trust: Its Policy.

How have we succeeded in Glasgow? So far as I can discover, our own Corporation (through the Improvement Trust) has, during the last few years, made more earnest efforts to deal with the housing problem than any other city. These efforts are as yet upon a small scale, but they are most interesting.

But, first, a glance at the history and general position of the Trust may perhaps be of service. I find that for 20 years before the actual constitution of the Trust, groups of public-spirited citizens had been struggling to effect improvements. A Model Lodging Association seems to have been in existence between 1840 and 1850, but little trace of its work remains. Latterly private citizens

had been acquiring old property for improvement, and we are told that, on the formation of the Improvement Trust in 1866, these purchases were handed over at cost price to the Improvement Trustees.[9] The Improvement Trust was created by an Act passed in 1866. It was originally intended as a temporary measure, to remain in operation for 15 years only, in order to clear away the closes and wynds, which had become bye-words for every kind of sanitary, social, and moral infamy. The clearances were made, some of the sites were sold for building, but in 1880 (about the end of the 15 years' period, and in a time of acute commercial depression) the Trust found itself the owner of ranges of the worst houses in the city still undemolished, as well as of acres of cleared sites, but without buyers for these sites. The Trust then obtained from Parliament a further lease of life, although ultimate winding up was clearly contemplated.

The Improvement Trust then practically stood still for some time. In 1884, when the first shock and disheartening effect of the depression of 1878 had begun to pass away, the citizens had brought home to them, by the eloquence of the late Mr. John Bright, all the grim meaning of life in the one-roomed houses of Glasgow.[10] The Improvement Trustees then endeavoured to set an example to builders to take up the vacant sites, by building blocks of model houses and shops in Saltmarket. But they proved to be models which no sane builder could follow, because it would not pay him to do so. Then the Trustees again stood still. In February, 1888, they were roused by the stirring address of their Medical Officer, Dr. J. B. Russell, upon "*Life in One Room*," and a fresh season of activity commenced.[11] I think I may say that one direct result of Dr. Russell's address was the appointment by the Presbytery of Glasgow in December, 1888, of a Commission "to inquire into the housing of the poor in the city, in relation to their social condition." That Commission submitted in May, 1891, a report of the greatest value.[12] In the meantime, the Housing Committee of the Kyrle Society had commenced the experiment

---

[9] "Evolution of Public Health Administration, as illustrated in the Sanitary History of Glasgow," Dr. J. B. Russell, 1895, pp. 24 and 38.

[10] Rectorial Address to the Students of Glasgow University, 1884.

[11] "Life in One Room, or some serious considerations for the citizens of Glasgow," a lecture delivered to the Park Parish Literary Institute, 1888.

[12] "Presbytery of Glasgow—Report of Commission on the Housing of the Poor in relation to their Social Condition." 1891.

of management on the lines followed so successfully by Miss Octavia Hill in London. The Glasgow Social Union was constituted, and in 1890 was instrumental in forming the Glasgow Workmen's Dwellings Company, Limited.

One would have expected that Dr. Russell's facts regarding the ticketed houses, their pitiful condition, and their high death-rate, would have stimulated the Corporation to show an example in building specially to meet the terrible state of affairs. Except, however, one small brick block in Saltmarket, built in 1890, and let at relatively high rents, no blocks of low-rented houses were erected by the Corporation until a few years ago. Tenements of shops and of splendid houses for the well-paid artizan were, however, erected in many quarters by the Corporation, on no other footing but that they should yield a present return sufficient to meet interest, and, I fear, irrespective of what class they were housing, and of what price they would realise if sold. In this way the Corporation has entered into competition with the ordinary builder under conditions which render fair competition impossible, and it is still building superior houses for the well-to-do, and, I contend, *losing money in the process.*

Take an example; a few months ago plans were passed involving the expenditure of over £10,000 in tenements of shops and 64 dwelling-houses, to be let on a scale of rental which will return 3½ per cent., and leave the equivalent of £2 12s. 6d. per yard for ground which is valued by the City Engineer at £3 per yard. In estimating the rate of return I am of opinion that inadequate provision is made for upkeep; if proper provision is made, I calculate that the value of the reversion in the ground becomes only 34s. per yard, to be further reduced if an ordinary business reserve be made for general depreciation. I do not think that any effort had been made to sell this site before determining to build upon it, and I feel sure that, if exposed for sale at 52s. 6d. per yard, there would have been competition for it. In short, the policy of the Trust seems to have veered round from one extreme to the other—at first ground was only built upon when no buyers came forward; now, apparently, buyers are not wanted.

The general conclusion I have reached is this—and I state it with all deference—that any *duty* upon the Improvement Trust to build, only begins where private enterprise breaks off, and that all ground acquired by the Trust under its improvement schemes should be sold for its market price, unless the houses to be erected

thereon are of the simplest character, and let at rents within the reach of the very poorest. The Trust should not build shops and better-class houses on the plea that the ground is too valuable for poor houses. If it is so valuable, it should be sold in the market, and it would be rapidly covered with warehouse and shop property. If the price realised for the ground is not what it cost, no matter, the loss should be faced at once, and written off as the cost of making the improvement. I most earnestly desire to give this view prominence at a time when further building schemes are on foot. Under the Improvement Act of 1897 a fresh crusade has been entered into, and a great deal of insanitary property has been, or will be, acquired by the Improvement Trust for demolition and for streets improvements. The new Act contains powers to borrow and spend £560,000, and also to purchase land "not exceeding in the whole 25 acres, either within the city or within a radius of half-a-mile from the boundary of the city, . . . for the purpose of erecting thereon dwellings for the poorest classes, . . . provided always that the Corporation shall not expend on purchase of such lands, and the erection of buildings thereon, a greater amount than £100,000" (§ 12).[13]

I am afraid that some of our enthusiastic Councillors get carried away by the feeling that the Improvement Trust is paying its way and yielding a surplus, but, in my view, the function of the Improvement Trust is not to borrow money and speculate with it and try to make more money; borrowing powers are being exhausted in building the wrong class of house. The policy of the Trust (if it has any) is inconsistent; if it exists for profit it should take the full profit, and not sell or utilise any ground under the sum the market will yield. But it does not exist for profit, it exists for use, and that policy has but two courses—either to restrict the building policy to housing the very lowest class who are otherwise unprovided for, or to sell the ground for what it may bring; either sell or rehouse the dispossessed poor.

Just as the Improvement Trustees have so well met the necessities of the poor lodger, so they must do all they can to meet the equally, if not more urgent, necessities of the poor householder, who requires not merely a nightly shelter for himself or herself, but a settled home where a family can be housed and reared in circumstances of health and decency.

---

[13] Glasgow Corporation (Improvements and General Powers) Act, 1897.

IV.—Its Accounts.

I am afraid that the *accounts* of the City Improvement Trustees will be most bewildering to the average citizen, owing to the elaboration of detail. In Table I., I endeavour to show at a glance the position of the Trust at May last; on the one side you have the assets, with their revenue and their rates of yield, and on the other side the liabilities; a continuation of the account shows further expenditure not contained in the balance sheet, and on the other side the contributions of the ratepayer.

At present the Trust is in a transition stage, or, at least, its accounts are. This is most unfortunate, as the lessons of its past experience are not available, just at the time when its work is being extended. Owing to what appears to be undue delay in placing valuations upon the sites which have been utilised, the first three items of the assets (being ground with and without buildings thereon) must be grouped together. Bearing in mind that many of the assets in that group consist of buildings in process of construction which were not revenue-producing, the rate of return, over 2¾ per cent. (£2 16s. 6d.), upon the capital sunk of £700,000, is, in one sense, satisfactory, as the Trust was borrowing last year at little over 2½ per cent. (£2 11s. 10d.). This is not the return upon the original cost of the sites. You will observe that depreciation to the amount of £320,000 has already been written off, but such depreciation (whether arising upon revaluation or realisation of sites) is rather the tardy payment by the community for the neglect by our forefathers of their duty as landlords and citizens in allowing the growth of the conditions which the Improvement Trust was formed to set right.

That form of depreciation, arising out of the *destructive* function of the Trust, is simply cost of "removal of nuisances," and cannot be objected to. But there is another form of depreciation which has not yet been faced by the Improvement Trustees, that is the depreciation upon their new buildings, arising under their *constructive* policy. With the exception of the model lodging-houses, the accounts fail to show any reserve for the inevitable decay and depreciation in property, which, although it may be minimised by careful management, is not always compensated by increase in capital value through improvement of the district or increasing rents—in other words, through the "unearned increment." We have sometimes "unexpected decrement" to contend with. I think it will be admitted that few, if any, of the blocks

erected by the Improvement Trust could at present be sold to cover their cost. Indeed, I find that valuing the more important blocks of shop and house property in the usual way, the value which remains to be placed on the ground is obviously lower than could have been realised in the open market.

I must point out, however, that there is what bankers would call an "inner reserve" in the accounts, owing to the rate at which the feu-duties and ground annuals have been valued. If put on the market to-day they would yield a large sum in excess of the valuation of twenty-four years' purchase. If such revaluation were made, the assets would be increased, the "excess liability" would disappear, and a sum remain towards meeting the inevitable depreciation on other items. Since the "Improvement Tax" diminished, and then disappeared, the indebtedness of the Trust is being reduced only out of surplus revenue; but it must be borne in mind that a slight rise in the rate of interest, say ¼ per cent., would wipe out the surplus, and a large part of such rise has already taken place during the past six months. Further, by a slight increase in the expenditure on property, whether from increased taxation or increased repairs —both certain to occur—the surplus will also be assailed. These may, however, fairly be met by the increase of the rental from properties now under construction. It is clear that the existence of the surplus depends almost entirely upon the ability of the Corporation to borrow at a low rate of interest.[14]

[14] The results for the year to May, 1898, may be put in another way, and taking round figures thus:—

Rents—excess of rate of return over rate of interest on nearly three-quarters of a million of property (including buildings under construction),		£1,956
Feu-duties—excess of feu-duties over interest on their present valuation,		4,892
Model Lodging-Houses, a similar excess of		1,942
Total surplus,		£8,790
Deduct on the other hand—		
Loss of interest on unproductive items and on the excess liability,	£3,044	
Loss on the Family Home and Osborne Street Laundry, with interest on their cost,	990	
General management expenses not allocated, less profit on workshop,	1,650	
		5,684
Reduces this £8,790 of surplus to the surplus shown in the accounts,		£3,106

TABLE I.—CITY OF GLASGOW

ABSTRACT OF BALANCE SHEET

WITH ABSTRACT OF ORDINARY REVENUE AND

		LIABILITIES. Amount.	EXPENDITURE
I. Borrowing Powers Exercised— Loans, bearing Interest on an average of £2 11s. 10d. per cent., ...		£1,287,204	£33,397
II. Sundry Claims, not bearing Interest, ...		4,949	...
III. Losses— On Family Home, ...	£501		
On Osborne Street Laundry, ...	32	...	533
IV. Expenses of Administration, ...	£3,120		
Less—Expenses of Manager's Office, allocated to Properties, Lodging-houses, &c., ...	1,080	..	2,040
V. Surplus of Ordinary Revenue over Ordinary Expenditure, ...		...	3,106
		£1,292,153	£39,076
Excess Liability brought down, ...		... ...	£79,291
Assessments received from Ratepayers, 1866 to 1896,		£597,003	
Less—Depreciation written off from time to time on revaluation of Assets, ...		320,000	277,003
			£356,294

IMPROVEMENT ACTS.

AS AT 31ST MAY, 1898.

EXPENDITURE FOR YEAR THEN ENDED.

	ASSETS.	REVENUE FOR YEAR.	
	Amount.	Net Amount.	Per Cent. on Capital.
I. Old Properties and all Building Sites (as valued by City Chamberlain and City Engineer in 1891), with Expenditure on New Buildings under construction, ...	£547,859	£10,816	...
II. New Buildings with Shops, completed (exclusive of Value of Sites, which have not yet been valued, but are included under Br. I.), ...	124,678	7,683	...
III. New Buildings, Houses only, completed (exclusive of Sites, as above), ...	29,114	1,333	...
Total of these (being Ground and Buildings together)	£701,651	£19,832	£2 16 6
IV. New Buildings on which Ground Rent has been imposed—			
Saltmarket Blocks, Shops and Houses,	22,463	876	3 18 0
Do. (brick), Houses only,	3,327	129	3 17 7
V. Feu-duties and Ground Annuals (as revalued on an average of 23·97 years' purchase, exclusive of Ground Rents imposed on New Buildings, Br. IV.), ...	326,817	13,375	4 1 10
VI. Model Lodging-houses & Drygate Laundry—			
Total Cost, ... £111,962			
Less—Depreciation, 14,499	97,463	4,471	4 11 9
VII. Family Home—Cost, ...	17,609	nil.	nil.
VIII. Joiner's, &c., Workshop, ...	1,095	393	...
IX. Sundry Debtors—			
Advances under Improvement Act, 1897, ... £32,136			
Arrears, Cash Balances, &c., 10,301	42,437	nil.	nil.
X. Excess of Liabilities over Assets carried down, ...	79,291	...	...
	£1,292,153	£39,076	...

Items not included in Balance Sheet—

Alexandra Park—Cost, ...	£40,000
Formation of Streets, Squares, Sewers, Covering over Molendinar and Camlachie Burns, &c., ...	106,279
Ground applied in formation of new and improvement of existing Streets, *say*...	210,015
	£356,294

Speaking with all deference, I am strongly of opinion that the accounts should be placed upon a proper basis by valuing all the sites built upon,[15] and then either realising the property and winding up the Trust—a course which, I fear, will not be palatable to many of the Trustees—or of initiating a sinking fund which will more definitely and scientifically wipe off the indebtedness of the Trust. No provision for a sinking fund is contained in the earlier Improvement Acts, but the new Improvement Act of 1897 provides for a sinking fund to pay off all borrowed moneys within sixty years, and in all the accounts of the London County Council a sinking fund is provided which will entirely clear off the expenditure on housing within periods ranging from fifty to one hundred years.[16]

V.—Typical Glasgow Blocks.

Let us turn now to the efforts of the Glasgow Corporation to deal with the housing of the troublesome class at the foot of the social scale, and compare them with the results of some other experiments. The accompanying Tables, Nos. II., III., IV., and V., have been prepared with the kind assistance of various officials of the Trust, and of my friend, Mr. William Fraser, surveyor, Glasgow. To some of the Tables have been added information kindly given me by the secretaries of the two London companies referred to earlier, and by the Burgh Engineer of Edinburgh. They bring to a focus various statistics, more especially of four blocks of property erected by the Glasgow Corporation, and also Cathedral Court, built by the Glasgow Workmen's Dwellings Company, Limited. All these blocks are built upon ground of approximately the same value, and (except the back brick tenement in Saltmarket, erected about 8 years ago) all are erected on what is known as the balcony system. There are single-roomed houses in all the properties except Morrin Square. All have been erected with the distinct object of housing the struggling poorer class, as defined earlier in the evening. The four blocks of the Glasgow Corporation contain practically the whole of the experiment of the Corporation to house this class, except the new buildings in

[15] On 16th February, 1899, the Corporation instructed a revaluation to be made.

[16] I have not dealt with the Imperial Statute of 1890—the Housing of the Working Classes Act—as no action has been taken under it in Glasgow, owing to the wide powers conferred by the various Improvement Acts.

Cumberland Street, Calton, for which the full cost has not yet been ascertained, nor a full year's results received. Except other three isolated and highly-rented blocks, they are the only Corporation properties where there are no shops.

VI.—THEIR COST.

Taking first Table II., and comparing the scale of cost in the usual way adopted by measurers and architects, viz., per cubic foot, it will be observed that Morrin Square is cheapest (5¼d.), although largely built of stone. The Saltmarket building of brick comes next (5⅓d.); then Kirk Street (5½d.); then St. James' Road and Cathedral Court together (6d.). The low rate at Morrin Square is partly due to the houses being larger, and the higher cost of St. James' Road is explained by the recent increase in cost of construction, while in Cathedral Court, although erected before the recent building boom, the cost was enhanced, not only by the difficulties of site—the tenements being necessarily very narrow—but also by very substantial work in many details, much having been done to minimise the cost of future upkeep at the expense of heavier initial cost.[16a]

The column for cost per room has been inserted to form an easy, though not a very sound, means of comparison with English houses. The size of room must be considered. The cost per inmate is, I think, the most scientific test. The column showing the amount per £ of rental absorbed in the rent of ground is instructive as an element in consideration of the great land question, a question which it will be impossible to deal with to-night. The London buildings and Cathedral Court appear at a much lower rate for ground, owing to their being five storeys high—to my mind one justification for high buildings.

[16a] It must also be borne in mind that the cost of construction of the Glasgow Corporation property is not stated on the same principles as the cost of constructing private property; for instance, the necessary charges falling on the ordinary builder for interest and ground rent during construction do not appear in the Corporation accounts, and it is a question whether the equivalent of architects' fees, conveyancing and Dean of Guild Court expenses, Master of Works' fees, as well as an equivalent for the general administration and supervision of a proprietor, are reflected in the accounts. Certainly no part of the Chamberlain's office expenses, the Town-Clerk's Fee Fund, or rent of Municipal Buildings, are charged to capital, but appear against the general revenue. I do not seek to elaborate this point, but it emphasises the difficulties of comparing the results of Corporation and private enterprise.

TABLE II.—COMPARISON OF COST OF ELEVEN BLOCKS OF "MODEL" DWELLINGS.

NAME OF PROPERTY.	DATE OF OPENING.	BUILDINGS.					GROUND.				GROUND AND BUILDINGS.	Reversion of Value per Square Yard of Ground, valuing Properties in usual way.
		Total Cost as Originally Estimated.	Actual Total Cost.	ACTUAL COST.			Net Area in Square Yards.	Rate per Yard.	Proportion of Site Built upon.	Amount per £ of Rental absorbed in Ground Rent (capitalized at 3½ per cent.)	Total Cost.	
				Per Room.	Per Actual Inmate Accommodated.	Per Cubic Foot.						
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
GLASGOW.												
Improvement Trust—												
Saltmarket (brick),	1890	£2,958	£3,326	£92	£31	5¼d.	1,164	20s. 0d.	40 °/₀	3s. 1½d.	£4,490	3s. 10d.
Morrin Square, -	1895	...	11,484	71	Not ascertained	5¼d.	2,653	20s. 0d.	47 °/₀	2s. 5d.	14,137	1s. 10d.
Kirk Street, - -	1896	2,500	2,500	55	34	5½d.	770	20s. 0d.	41 °/₀	2s. 10d.	3,270	3s. 4d.
St. James' Road, -	1897	5,000	6,738	93	42	6d.	1,280	20s. 0d.	55 °/₀	2s. 5½d.	8,018	nil.
Dwellings Coy.—												
Cathedral Court, -	1892	7,465	6,647	51	22	6d.	1,110	20s. 0d.	50 °/₀	1s. 8d.	7,757	nil.
LONDON.												
East-end Dwgs. Coy.—												
Lolesworth Bldgs.,	1887	...	14,202	54	28	...	2,543	32s. 3d.	46 °/₀	1s. 7d.	18,302	
Katharine Bldgs.,-	1885	...	16,957	60	31	...	2,788	27s. 10d.	44 °/₀	1s. 4d.	20,837	
Guinness Trust—												
Brandon St. Bldgs.,	1891	...	25,031	70	42	...	3,447	22s. 3d.	35 °/₀	1s. 5d.	28,866	
Page's Walk Bldgs.,	1895	...	68,706	69	42	...	7,924	28s. 9d.	35 °/₀	1s. 6d.	80,097	not ascertained.
EDINBURGH.												
Corporation Bldgs.—												
High School Yards,	1897	9,977	10,545	97	...	7d.	1,010	20s. 0d.	57 °/₀	1s. 2d.	11,545	
Tynecastle, - -	1898	8,700	9,266	96	...	6d.	2,680	5s. 0d.	29 °/₀	11d.	9,886	

To appreciate the degree to which these houses supply the need for a cheap and simple dwelling, we must turn to Tables III. and IV. The first column of Table IV. shows the overhead rate of rental per square foot, being the method usually adopted by architects and valuers, but inappropriate here, inasmuch as one and two-roomed houses are all necessarily treated together. The rate for modern tenements in Glasgow is about 5d. and 6d. per square foot. Table No. III. is the truer test, especially the column No. 6 (rent per 1,000 cubic feet), in which the rents are reduced to a unit of air space obtained. I have embodied in this Table some most valuable statistics as to "ticketed" and "uninhabitable" houses, prepared by Dr. Russell some years ago, but still applicable.[17] This Table shows that the scale of rental in St. James' Road property is very low, the rate per 1,000 cubic feet for one room being only slightly over that obtained for houses classed as "uninhabitable," while the rate for two rooms is actually considerably under that obtained for a two-roomed "uninhabitable" house! Cathedral Court scale for a two-roomed house is also lower than that of the "uninhabitable" and "ticketed" houses. Indeed, we find that the rents of the ticketed houses are all much dearer —actually dearer—per 1,000 cubic feet than any of the model houses, with the trifling exception of two rooms in Kirk Street. These figures mean little or nothing without taking into account the unutterable difference between the model houses and those stigmatised as "ticketed" and "uninhabitable." Is it not very striking that in the model buildings wholesome accommodation can be obtained at a cheaper rate than the unwholesome accommodation of the "ticketed" and "uninhabitable" houses? Surely these model houses are meeting the needs of the very humblest classes?[18]

---

[17] Paper on "Uninhabitable Houses" read to the Congress of the Sanitary Association of Scotland, August, 1894. *Sanitary Journal*, 1894.

According to Mr. Peter Fyfe's recent inquiry, the average rents of the ticketed houses have risen during the past ten years—one room, from 7s. 11d. to 8s. 2¼d. per month; two rooms, from 10s. 3d. to 10s. 10d. per month. This increase strengthens my argument.

[18] It would be most useful to have additional evidence of the extent to which these houses serve their purpose, from the relation between the earnings of the tenants and the rents they pay. No statistics of earnings are yet available for the Glasgow Improvement Trust tenants, but for the Guinness Trust Buildings in London the average earnings per household are reported as 20s. 3½d. per week; average rent, 4s. 4¾d. per house per week, or 21¾ per cent. of earnings. In Cathedral Court (Glasgow Workmen's

VII.—Their Rents.

TABLE III.—COMPARISON OF RENTS AND CUBIC SPACE IN "MODEL" DWELLINGS, WITH "TICKETED" AND "UNINHABITABLE" HOUSES.

CLASS OF HOUSE.	Total Cubic Space.	Average Statutory Limit of Inmates.	Average Number of Inmates (Actual).	Average Cubic Space per Actual Inmate.	AVERAGE RENT.			
					Per Actual Inmate per Month.	Per 1,000 Cubic Feet per Month.	Per Month.	Per Annum.
	1.	2.	3.	4.	5.	6.	7.	8.
GLASGOW.								
(*a*) One Room.								
"Ticketed," -	1,058	2½	3·17	334	30d.	90d.	·7/11	£4 15 0
"Uninhabitable,"	1,265	3	3·18	411	25d.	61d.	6/5	3 17 0
Saltmarket (brick),	1,818	4½	3·00	606	48d.	79d.	12/	7 4 0
St. James' Road,	1,662	4	2·32	716	45d.	63d.	8/9	5 5 0
Kirk Street, -	1,166	3	1·70	686	53d.	77d.	7/6	4 10 0
Cathedral Court, -	1,275	3	1·25	1,020	66d.	81d.	6/11	4 3 0
(*b*) Two Rooms.								
"Ticketed," -	1,725	4¼	4·66	370	26d.	71d.	10/3	6 3 0
"Uninhabitable,"	1,690	4	4·24	398	24d.	69d.	8/6	5 2 0
St. James' Road,	2,867	6½	4·33	662	34d.	53d.	12/6	7 10 0
Kirk Street, -	1,889	4½	2·86	660	52d.	79d.	12/6	7 10 0
Cathedral Court, -	1,800	4½	2·75	658	42d.	64d.	9/8	5 16 0
EDINBURGH.								
(*a*) One Room.								
High School Yards,	2,473	...	...	...	...	49d.	10/	6 0 0
Tynecastle, - -	1,985	...	...	...	...	60d.	10/	6 0 0
(*b*) Two Rooms.								
High School Yards,	3,188	...	...	...	...	58d.	15/5	9 5 0
Tynecastle, - -	3,125	...	...	...	...	57d.	15/	9 0 0

Note.—"The average Annual Rental of new Houses of one apartment in Glasgow may be stated at from £7 to £7 10s., and of new Houses of two apartments from £11 to £12."—City Assessor, *6th December*, 1898.

TABLE IV.—COMPARISON OF RETURN ON CAPITAL OF ELEVEN BLOCKS OF "MODEL" DWELLINGS.

	Rate of Rental of Houses.	Outgoings per Accounts (Including Actual Repairs, per Table III).		Outgoings after increasing Charge for Improvement Trust Management by 2½ per cent. on Rental and charging 12½ per cent. of Rental for Repairs and Depreciation instead of Actual Repairs.		Return on Total Cost after deduction of 40 per cent. of Rental for all Outgoings and Depreciation.	As Column No. 5, but valuing Ground at 10s. per Yard more than Cost, as ascertained (per Table II.).
	Per Square Foot.	Outgoings per cent. of Rental.	Return on Total Cost.	Outgoings per cent. of Rental.	Return on Total Cost.		Return on Total Cost.
	1.	2.	3.	4.	5.	6.	7.
GLASGOW.							
Improvement Trust—							
Saltmarket (brick),	5½d.	25·6	£4 5 6	32·0	£3 18 4	£3 9 3	£3 9 4
Morrin Square,	4¼d.	25·5	4 1 4	31·5	3 14 11	3 5 7	3 8 6
Kirk Street,	5d.	28·3	4 2 7	34·3	3 16 5	3 9 4	3 8 4
St. James' Road,	3¾d.	25·8	3 7 10	32·3	3 1 10	2 14 11	2 17 6
Workmen's Dwellings Coy.—							
Cathedral Court,	4⅓d.	31·1	4 0 5	40·3	3 8 10	3 8 10	3 4 3
LONDON.							
East-end Dwellings Coy.—							
Lolesworth Buildings,	Not ascertained.	44·7	5 8 7	48·7	5 3 5	Data not available.	4 13 0
Katharine Buildings,		44·7	5 6 9	47·4	5 1 11		4 13 3
Guinness Trust—							
Brandon Street,		35·1	4 3 9	45·3	3 10 7		3 6 2
Page's Walk,		34·1	4 7 5	46·1	3 11 7		3 6 9
EDINBURGH.							
Corporation Buildings—							
High School Yards,	6d.	25·6	4 4 7	...	...	2 18 2	...
Tynecastle,	6¾d.	24·8	3 18 3	...	...	2 18 8	...

But note the lesson of column 5. The tenants of the "ticketed" and "uninhabitable" houses make their accommodation go much further; they crowd their houses up to and over the statutory limit, so that we find that the rent per actual inmate in these slum houses is roughly half the rent per inmate of the model houses. But, of course, they have, for half the rent per inmate, half the air space per inmate. It is the old story, the smaller the quantity and the lower the quality, the higher is the relative price.

The tenants of the worn-out "made down" ticketed houses require to pay a penalty for their poverty, their want of character, their disorderly and destructive habits, and those who do pay are burdened with rent which their neighbours escape paying.

VIII.—Their Upkeep and Yield.

I have been at considerable pains to learn the cost of upkeep, repairs, &c., in the model blocks, and you have the results in Table V. In all the blocks, except those of the Glasgow and Edinburgh Corporations, there is a resident caretaker. In the Guinness blocks, which are from four to ten times the size of the Glasgow blocks (Table II., col. 3), the rate for caretaking and collection is low; it naturally diminishes with the size of the blocks. It has been found impossible to separate the landlords' and tenants' taxes in the London blocks—the rents there include all taxes.

As to repairs, you will observe that while the Guinness Trust percentage is (like Cathedral Court) very low, in the older blocks of the East End Dwellings Company, the cost becomes very heavy, in spite of the caretaker. The Edinburgh properties are much too recent to enable any inference to be drawn. The rate of repairs in the Glasgow Corporation blocks is high, especially in St. James' Road, which at date of the accounts was only one year old. In tenements perhaps 30 or 40 years old, which have been renovated and *placed under a resident caretaker*, the repairs average about the same as the new Corporation blocks *without a caretaker*. Much depends upon the soundness of the original structure. I do not think any safe inference as to the future can be drawn unless we increase the Corporation charges to cover the cost of a caretaker and depreciation; in fact, for such houses

Dwellings Company, Limited) the average earnings per household are stated at 18s. 8d. per week, and the average rent per house per week is 2s. 10¾d., or 15½ per cent. of earnings. For comparison, all taxes (owners and occupiers) are included in above figures. In these blocks, therefore, the right class are being received.

TABLE V.—COMPARATIVE COST OF UPKEEP OF ELEVEN BLOCKS OF "MODEL" DWELLINGS.

	PERCENTAGE OF OUTGOINGS TO NET RENTAL.										
	GLASGOW (Excluding Tenants' Taxes).					EDINBURGH.		LONDON (Including Tenants' Taxes).			
	Improvement Trust.				Glasgow Dwellings Co.	Corporation Dwellings. §		East-end Dwellings Co.		Guinness Trust.	
	Saltmarket (brick tenement) Average of Three Years.	Morrin Square. Average of Two Years.	Kirk Street. Average of Two Years.	St. James' Road. One Year. (Weekly Rents.)	*Cathedral Court. Average of Three Years. (Weekly Rents.)	High School Yards. One Year.	Tynecastle. Estimated for One Year.	Lolesworth Buildings. Average of Two Years. (Weekly Rents.)	Katharine Buildings. Average of Two Years. (Weekly Rents.)	Brandon Street. Average of Six Years. (Weekly Rents.)	Page's Walk. Average of Two Years. (Weekly Rents.)
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Repairs (Actual Cost), -	8·60	9·05	8·98	8·55	3·32	1·16	3·10	10·97	12·28	4·79	3·01
Management, viz.:—											
Collection, - -	2·77	3·27	2·85	3·09	6·49	4·16	5·18	...	...	...	...
Miscellaneous, - -	0·04	1·—	2·87	1·53	·23	1·16	2·07	1·39	1·24	...	...
Resident Caretaker, -	...	...	...	...	6·87	...	...	6·64	9·67	8·43	5·89
Total of above, -	11·41	13·32	14·70	13·17	16·91	6·48	10·35	19·—	23·19	13·22	8·90
Taxes, Water, and Gas,	11·52	11·75	12·38	12·18	13·—	11·66	12·42	24·04	18·73	21·87†	25·22†
Insurance, - - -	·38	·42	·87	·51	1·24	·83	2·07				
Bad Debts and Unlet, -	2·30	·04	·36	...	·03	‡6·66	...	1·72	2·80		
Total Outgoings, -	25·61	25·53	28·31	25·86	31·18	25·63	24·84	44·76	44·72	35·09	34·12
Interest on Ground at, *say*, 3½ per cent., -	15·73	12·01	14·26	12·21	9·50	5·83	4·95	7·97	6·75	7·20	7·49
Surplus, - - -	58·66	62·46	57·43	61·93	59·32	68·54	70·21	47·27	48·53	57·71	58·39
	100·—	100·—	100·—	100·—	100·—	100·—	100·—	100·—	100·—	100·—	100·—

* The Bonus to Tenants at Cathedral Court has been deducted from the gross rental before calculating these percentages.

† Including Miscellaneous Expenses.

‡ Unlet Shops only.

§ The Rents in Edinburgh include all Tenants' taxes, except Poor and School Rates.

the future outgoings cannot safely be assumed to average less than 40 per cent. of the rental.

The average return on cost as shown in Table IV., cols. 2 and 3, are inserted as evidence of how fallacious the figures appearing in the accounts may prove. Column 5 is an attempt to reach a fair basis of comparison, as it shows the rates of return, after allowing about 5 per cent. of rental for management, and 12½ per cent. of rental to cover repairs and depreciation.[19]

Column 6 (*i.e.*, deducting 40 per cent. of rental for outgoings and depreciation) is, however, the most sound and safe basis to adopt in forecasting the financial result of these experiments. On this basis the yield would be—

Saltmarket, - - - -	£3	9	3
Morrin Square, - - - -	3	5	7
Kirk Street, - - - -	3	9	4
St. James' Road, - - -	2	14	11
Cathedral Court, - - -	3	8	10

If we take the three last properties alone as representative, the average return is 3⅛ per cent. (£3 3s. 7½d.), or if we are content with, say, 2¾ per cent., we would have sufficient in hand to enable us to pay over 10s. (10s. 5d.) more per yard for ground.[20]

[19] The basis of comparison is not quite the same in all the properties, as at Cathedral Court there is the resident caretaker, costing nearly 7 per cent. of the rental, but whose services are reflected in the small ratio of actual repairs (3⅛ per cent., as against from 8½ per cent. to 9 per cent. in the Corporation properties). Consequently, in the rates of return in column 5 the margin for depreciation in the allowance of 12½ per cent. is about 9 per cent. of rental in Cathedral Court, but only 3½ per cent. to 4 per cent. in the Corporation properties. In a certain sense the Cathedral Court caretaker is, as it were, charged twice over in column 5. If (for comparison) we charge cost of caretaking against the 12½ per cent. allowance for repairs, we raise the return in Cathedral Court to 3½ per cent. (£3 10s. 2d.).

[20] The low scale of rental charged in these properties is largely the explanation of the low returns. There is no doubt that in St. James' Road property and in Cathedral Court higher rents can readily be obtained. Valuing the properties in the ordinary way at so many years' purchase of the present rental—that is to say, valuing on the basis of a 4 per cent. or 5 per cent. return—we find that the reversion of value in the ground becomes very low, and even valuing St. James' Road and Cathedral Court at 15 years' purchase, no value remains in the ground (Table II., column 12). In other words, an ordinary builder could not have erected these two properties and let them at the rents presently charged unless he had got the ground for nothing.

I, therefore, state it as my deliberate opinion that plain and sanitary houses, built on ground costing 20s. per yard, managed efficiently, and let at rents similar to those charged for the average ticketed house, will yield the builder a return of 3 per cent. to 3¼ per cent.; while if a 2¾ per cent. return suffices, 30s. per yard, or even more, may be paid for ground.

This is a most important result, and to my mind a satisfactory result, because, low as the return is, I think it justifies the Corporation in erecting low-rented houses on sites which do not cost more than 20s. to 30s. per yard. It is clear that private owners cannot build such houses on ordinary commercial lines, but it is the duty of the city (which may be supplemented by any semi-philanthropical agencies) to undertake such building for *selected* tenants of the humbler class—tenants who would otherwise be forced to herd with the disreputable and degraded, or who, through failure to find other accommodation, might be thrown upon the rates.[21] The erection of houses by the city for such people cannot have a pauperising effect. For it is a wise policy to preserve the innocent as well as to attempt to reclaim the lost, and to supply decent houses, which will in turn certainly improve the standard of comfort, and thereby tend to raise the level of efficiency and the level of wages.

One is inclined to ask the question—Did not the Improvement Trustees look for higher returns when it was resolved to erect these buildings? In other words, was it the declared policy of the Trust to erect buildings for the poorest classes upon a return of only 2¾ per cent. or 3 per cent.? Would the Improvement Trustees have sanctioned the erection of these buildings unless they had anticipated a higher return? I make bold to say that I do not think they would have been erected. At the same time, everyone who does his best to take a broad view of the position must rejoice that these buildings have been erected, and, with the exception, perhaps, of Morrin Square, where there are no houses of one room, I should earnestly desire to see the Corporation continue building similar houses, even if the result is a return of only 2¾ per cent., the rate of interest at which money can meantime be borrowed.

---

[21] The Improvement Act of 1897 grants special powers to purchase ground "for the purpose of erecting thereon dwellings for the poorest classes." Section 12.

IX.—Renovation of Insanitary Houses.

It will be impossible to-night to discuss in detail the finance of renovation and alteration of old properties. That is not so much a question of public policy as of individual and private effort. There is no doubt that such a work serves two good purposes—destroying insanitary houses, and replacing them by fairly sound and wholesome houses. Any extensive movement to buy up dilapidated properties naturally forces up their price, and the results are not of so much interest to political economists as to social reformers, because the financial success largely depends upon the property being acquired *at very much less than its original cost.* Although the cost of upkeep is naturally higher than in a modern building, the financial returns are satisfactory to the landlord, where the property has been cheaply bought, and even after extensive overhaul. The rate of return largely depends upon the thoroughness of the restoration and the methods of management. Of course, a property may be thoroughly overhauled at once, all tenants meantime ejected, and a careful selection made of new tenants. That is the most satisfactory way where the character of a district is fairly good, and where the property being restored is an isolated block. But where the general character of a district is low, where the property is surrounded by many others of a degraded class, and where the street has got a bad name, then the prudent course may be to introduce at first only the most rudimentary improvements, and to comply only with the most urgent of the sanitary requirements. Then, by giving all the tenants a chance, gradually wiping out hopeless cases, it becomes possible, slowly and steadily, to introduce improvements as the character of the tenants rises, and as they prove themselves able to appreciate and safeguard the improvements.

The Health Committee in 1890 obtained powers which have enabled a revolution in the smaller houses of Glasgow to be quietly and steadily carried out. By compelling landlords to introduce water supply and modern sanitary accommodation, the new Act "struck at the root of all that filth in the wynds and closes which was so prominent in the criticisms of visitors, but could scarcely be described; it singled out the one element in the circumstances of the inhabitants which thirled them to indecency and made immorality natural."[22] That Act also placed in the

[22] Dr. Russell—"Evolution of Public Health," &c., *supra*, page 46.

hands of the authorities a summary means of closing houses certified as unfit for human habitation. It is estimated that several years must yet elapse before all the flagrant cases have been dealt with—the policy of the Health Committee being to proceed gradually but steadily; their difficulty, I understand, being that, if they enforced the provisions of the Act all at once, the poorest tenants would be unable to get shelter elsewhere at rents similar to what they had been paying; the landlords, of course, demanding advanced rents to compensate for the outlay in bringing their property up to modern sanitary requirements. The far-reaching effect of these improvements can hardly be expressed in figures, but I calculate that the comfort of 120,000 of the poorest people in Glasgow has been, or will shortly be, secured by the introduction of water-closets alone. This amounts really to a revolution in the comfort of small houses throughout the length and breadth of the city, a revolution which must certainly be reflected in the health and habits of the tenants, in an increased standard of comfort and morality. However, the tenants, as a rule, require to be taught not to abuse the new things, and I am convinced that, in time, it will be found essential to appoint caretakers in many cases.

X.—MANAGEMENT, CARETAKER, &c.

The profitable and successful holding of low-rented houses hinges largely upon firm and efficient management. May I briefly indicate the principles of administration which I think should be followed? Generally, control can hardly be too stern and strict; but to have its full effect it must be directed by a kind and sympathetic heart. Secondly, a resident caretaker is absolutely essential; a suitable man (not easy to obtain) who undertakes all minor repairs, puts in the "stitch in time" which "saves nine," and therefore also saves a large part, if not all, of his wages in diminished repairs. Then, apart from his care of the houses, his influence, and that of his wife, upon the habits of his tenants, is most valuable. They supervise the people generally, and press steadily against ingrained habits of filth and disorder; the dirty or disorderly tenant never knows when the caretaker may look in; and his control also ensures a wise forbearance, so that those who really are deserving of a further trial are again put on good behaviour, while those who are hopeless and irreclaimable are ruthlessly ejected to make room for someone else who may make better use of his opportunities.

which, with their want of foresight, they generally make no provision. The benefit to the rating authorities must also be enormous, as in one of our properties, where there are nearly 100 tenants, we find from the rolls that only two of these had a vote last year, owing to their not having paid their poor's rate in time, while I understand that the irrecoverable arrears in that property last year amounted to 90 per cent. of the amount assessed. This year the taxes (through our collection) will be paid in full. This is an example of how strong is the control of a landlord compared with that of an outsider—even a tax gatherer. We can get access to our houses, and ready payment of rent, where the tax collector, tracking us up and following on our heels, can get nothing but closed doors; we have the power of ejectment and he has not.

Now this I must bring home to you, that the power of the landlord for good or for evil is practically unique; the influence he can bring to bear upon his tenants is the most powerful known to them. The landlord is indeed able to say, "Go, and he goeth!" "Behave, or leave!" And it is this power which I wish to see directed entirely for good, and called into co-operation with the powers possessed by the Magistrates.

XI.—Policy of Control.

My gospel of sanitation seems a hard one, and perhaps at first inconsistent, for I say—scatter the people; drive them out of their dens; crush out the disreputable and the dissolute by the most unbending discipline; put down most sternly all insanitary conditions, all overcrowding; let all property owners unrelentingly select tenants, and if, after a fair chance, and in spite of all good influences, tenants fall into evil ways, expel them as by an inexorable law. I say—let no bad characters find it possible to get a shelter at all, unless under control; they degrade the properties they enter, and they degrade their neighbours; let them behave and reform if they wish to have a roof over their heads. But this is only one process—the scattering is but a stage to concentration. If they will not behave and reform, then they must perforce find resting-places somewhere under control—in the licensed lodging-house, the poorhouse, the lunatic asylum, the infirmary, the labour colony, or the jail. And I suggest that we should also provide another alternative, which I shall deal with shortly—municipal houses of the plainest

sort for rejected tenants, and under something akin to police supervision, but distinct from houses for the industrious poor.

In brief—I say eject all bad tenants; drive them ruthlessly from pillar to post until they become tolerable, or leave the city, or find their resting-place somewhere under control. I admit that such stern control in dealing with the suffering dregs of humanity will be difficult to enforce until two things happen—first, our constructive policy overtakes our destructive policy, and the authorities have, consequently, no excuse for leniency; and, second, until slum landlords realise their responsibilities.

XII.—HINDERED BY MAGISTRATES' LENIENCY.

I may instance several ways in which the humane feelings of our Magistrates largely nullify the benefit of existing laws. For instance, the penalties inflicted for overcrowding—one of the most insidious and deadly evils—are very inadequate, so much so that it pays the habitual offender to be fined rather than take a larger house. Although the sanitary inspectors only bring the flagrant offenders into Court, only one-half of these again are convicted by the Magistrates, the others being merely dismissed with an admonition—to laugh and chuckle on leaving the Court, and come up again later on. The Magistrates say, "Poor creatures, they cannot find proper houses," or "they cannot afford larger houses," or "they have been merely helping a friend." Unfortunately, many of these pleas are quite unfounded; sharp fines in persistent cases would be more appropriate.

Then, again, owing to the increasing scarcity of low-rented houses, the Magistrates hesitate to enforce the very sweeping powers entrusted to them by the Act of 1890 of closing uninhabitable houses. They say, "Where are these poor people to go; we cannot turn them into the street?"

And, again, the extensive powers of dealing with vagrants and reporting them to the parochial authorities are in abeyance, only 5 per cent. of those apprehended being convicted, the result being alarming numbers of sturdy tramps and beggars.

Finally, the efforts of landlords to get quit of defaulting and disorderly tenants are thwarted by the tender-hearted Magistrates sitting in the Burgh Court, who now almost invariably allow the objecting tenant an additional period of ten days to "look for a new house." This leniency has become more marked of recent years, and so bad tenants systematically take advantage of

it to "lodge answers" at a cost of a few pence, *merely to gain time.* That this leniency now amounts to a scandal is shown in Table VI., where the proportion of "answers" to ejectment petitions is set forth, the percentage having risen from 2½ per cent. seventeen years ago to nearly 30 per cent. to-day. During the extra period of grace granted by the Magistrates the tenant can defy his landlord and destroy the house, and, of course, he declines to pay any rent. Upon a moderate calculation, based upon the Table referred to, the loss to Glasgow landlords through the mistaken leniency of the authorities amounts to some thousands of pounds per annum. Instead of placing difficulties in the way of getting quit of bad tenants, the Magistrates should co-operate with the landlords, enlist their aid, and, I go further and say, take the initiative, and compel the landlords to get rid of all unsatisfactory tenants. These are good instances of the principle that "Emotional benevolence applied to misery in the mass creates the evils it blindly seeks to destroy. Benevolence by government is more cruel than inexorable law."[24]

TABLE VI.—STATEMENT SHOWING THE NUMBER OF PETITIONS FOR EJECTMENT IN THE GLASGOW BURGH COURT, AND ANSWERS LODGED THERETO BY TENANTS.

Year.	Number of Petitions for Ejectment.	Number of Answers Lodged.	Percentage of Number of Answers to Petitions.
1870	3,624	17	½ %
1875	2,780	8	⅓ %
1880	6,376	52	¾ %
1885	8,760	226	2½ %
1890	11,092	420	3¾ %
1895	11,636	3,300	28⅓ %
1897	12,740	3,756	29½ %

XIII.—Landlords' Indifference.

But, if the magistrates are lenient, many landlords and factors are careless. In full knowledge that I shall be severely taken to task, my suggestion is not only to enforce existing law, but also to place additional responsibilities on the landlord—to extend through

[24] Arnold White—"Tries at Truth," page viii.

him the principle of control of the tenant. No thorough and enduring improvement in the conditions of housing will be attained until it is admitted that the landlord, receiving profit from house owning, must not only assume full responsibility for the condition of the building, but must also be held to possess a knowledge of the character of its inmates. "When men's lives are at stake on one side and men's profits on the other, it is the profits, not the lives, which must be surrendered."[25]

A landlord is now by law held to guarantee that every house he lets is fit for healthy living, just as a shipowner must provide a seaworthy ship. A tenant may obtain damages for ill health arising from defects, and the authorities may remedy these and recover the cost from the owner. Unfortunately, owing to the scarcity of cheap houses, the initiative in fixing this responsibility cannot yet be left to the tenant. Complaining tenants are got quit of, and repairs left undone. The tendency is rather to let the uncomplaining tenant remain as long as rent is paid—no matter how bad his character and conduct may be.

The majority of factors do their duty well (often in most trying circumstances and for inadequate reward), and they would not willingly house the degraded or the vicious; but now *someone* must, knowingly or unknowingly, house these unfortunate people, and if such house owners will not be aroused to a sense of their responsibility for the behaviour of their tenants, and the use to which their houses are put, then it may become, and I say it has now become, the duty of the city to place upon them certain responsibilities for the conduct of their tenants — a responsibility which need not trouble men who are already doing their duty. Dr. Russell says:—"If I were desirous of promulgating a theory of social reform, I would base it, by preference, upon the higher morality of house owning—a very broad basis—because it includes not merely the landlord and the factor, but the trustee, the beneficiary, the bondholder, and it touches every tenant. No matter through what channel the rent of the uninhabitable house reaches our pocket, it brings a burden of responsibility with it."[26]

How is this responsibility to be enforced? The first step would

---

[25] Arnold White—"Tries at Truth," p. 85.

[26] Paper quoted above on "Uninhabitable Houses."—*Sanitary Journal*, 1894, p. 385.

be to apply existing powers,[27] and make persistent overcrowding a landlord's as well as a tenant's offence. This might first be done by reporting repeated cases to the factor, with a request to eject the offenders. All good factors, whether of dwelling-houses, "farmed houses," or lodging-houses, would at once comply with such a request. It is in their interest to encourage tenants to seek larger houses at higher rents. Similarly other nuisances, both inside and outside of the house, and considered at present matters for the tenant, should be reported to the landlord. No increase in the sanitary staff should be grudged to effect the necessary inspection—the troublesome element requires to be drilled into cleanliness. Then let the police warn the owners in all cases of bad conduct, disorder, or profligacy occurring in their properties—dens of thieves would then be firmly handled both by landlord and police. Such control would, of course, be a gradual evolution, but I should say that, where factors ignored such reports, the real owner, sheltering behind the factor, could be communicated with. In New York the expedient has been discussed of publishing the names of the real owners of all slum properties. Public opinion, well directed, may accomplish much. I am well aware that here is the greatest difficulty—the selfishness, apathy, and ignorance of the absentee slum landlord, and the carelessness of the overworked and underpaid factor. One immediate result of trying to bring home to the landlords their responsibilities would be the appointment by them, in self-defence, of resident caretakers, who, as I have shown, need not add much, if anything, to cost of management, as they will save their wages in diminished repairs. As a rule, good properties find good tenants; bad properties find bad tenants. If bad tenants are found in a property the landlord is responsible.

XIV.—Results of Control.

This housing question is therefore largely one of concentrated administration and inspection, and the vigorous control I advocate

[27] See Public Health (Scotland) Act, Sections 16, 19, and 47. Section 16 classes an overcrowded house as a "nuisance." Section 19 states that "the authors of the nuisance or the owner of the premises may be ordained . . . . to limit the number of persons who may be accommodated in any house or part thereof, overcrowded," &c. Section 47 provides that where two convictions for overcrowding are obtained within three months, "whether the person so convicted were or were not the same, it shall be lawful for the Sheriff, or any Magistrate or Justice, to direct the closing of such premises for such time as he may deem necessary."

will have surprising results, especially if we can stimulate the police and sanitary authorities into co-operation with the owners of lower class property, whose power over their tenants for good has really no parallel. An iron rule of authority, unsympathetic and harsh as it seems, will really in the end benefit these tenants.

May I outline briefly how such a policy would work? I fancy that many of the troublesome class would migrate to other cities where control was not so strict, until such cities, in their turn, were forced to adopt the same course. Many dispossessed tenants would drift into lodgings, where they would find out the drawbacks of living under the control of the lodging-house keeper and inspectors, until they were fit again to be entrusted with houses of their own. We have in Glasgow a variety of lodging-houses probably unequalled in the world—lodging-houses for men and for women, and now the "Family Home."[28] We need have little hesitation in sternly handling the able-bodied who will not work, for now the Labour Colony has been established, and we have the Charity Organisation Society Shelter and the Salvation Army Shelter, and I trust soon to see some similar means of dealing with the chronic drunkard. For those who are infirm and unable to work, weak in body or in mind, they will reach some charitable institution or the workhouse, the lunatic asylum or the infirmary; for the wrongdoers, there are the jails for the adults, reformatories for the young. This is the only way by which we can separate well-doers and ill-doers. We must not make things pleasant for the idle and vicious, but "must cheerfully acquiesce in the disappearance of the vermin of society, while we redouble our efforts to extricate the children" and the "deserving poor who are leading quiet lives of misery through no fault of their own."

XV.—HOUSES FOR "REJECTED" TENANTS—THEIR NECESSITY.

But I know it will be said to all this, have you no consideration for the feelings and distress of these wretched people? Will

[28] The Municipal Family Home in Glasgow I regard as a noble pioneer effort which throws much light upon the dark way we are groping along. The building has been found to be too large so far, the expectations of the numbers willing to take advantage of it not having been realised. Those who need it most, dread its control and discipline, and keep away. It is now almost restricted to widowers with young families, but only about one-half of the accommodation is taken up. Hence the loss shown in the accounts of the Improvement Trust.

you not leave them a few rookeries in which they may die off? But remember that my suggestions include not only the erection of low-rented houses for selected tenants, but also the provision of absolutely simple and cheap houses under the most strict discipline, erected by the city, and, if necessary, partly supported by the rates. "City Shelters," or "City Homes," call them what you will, I think will come in time—houses which would act as "*receptacles*" for the intolerable class driven out of their haunts by stricter administration, and houses *quite distinct* from any houses erected by the city for the decent, struggling, working class. I advocate two classes of municipal houses—one for the decent, industrious poor, to pay a minimum interest; the other a refuge for the thriftless residuum, a standing answer to any attempt at misplaced leniency of administration—houses which need not be expected to pay except in the control they would afford of their occupants—houses whose success would be the greater the less they were occupied. And it is with no slight feeling of hesitation that I suggest any scheme for housing the class whose housing has hitherto been deemed an insoluble problem, especially a scheme which will involve further capital commitments and possible calls upon the ratepayers; but I feel sure that if we do not seriously face an experiment in this direction our successors will justly reproach us. The citizens of Glasgow have already contributed £600,000 of the cost of the original City Improvement Scheme. They thought fit to replace their "fever tax" by an "improvement tax," and I think the natural evolution is to replace the improvement tax by a "housing tax."

The present policy is to tax the whole community for providing "those physical accessories of small houses which dwellers in large houses provide for themselves, which from mere want of space the poor cannot have, but which, if they are indeed brothers and sisters, they require as much as the rich. Taxation for such purposes is eminently Christian in motive and effect."[29] For instance, we are taxed for public baths and wash-houses, fever hospitals, children's playgrounds, parks, football fields. We are within sight of free libraries, but we have not yet got the length of providing drawing-rooms and smoke-rooms—we leave these to the publican meantime. The physical accessories which we have provided, I am sure, have "paid" in the increased comfort, and therefore increased efficiency, of the workers; and I am emboldened

[29] Dr. Russell—"Life in One Room," p. 22.

to say that it is better to place upon the rates part of the cost of new houses for the dangerous classes than to pay in the end perhaps twice as much for them as prisoners, paupers, or lunatics. Remember, I do not say *free* houses, but rate-aided houses.

XVI.—THEIR MANAGEMENT, DIFFICULTIES, &c.

If time admitted I might explain more fully what is in my mind about such city shelters as distinct from ordinary houses. But the general lines would be strictest discipline; practically resident police inspection, but no preliminary inquiries made as to character; enough that the applicants were willing to enter, but they would have every discouragement to wait, and every encouragement to leave; all in receipt of outdoor poor relief would be excluded; rents would be payable weekly in advance, taxes included, with probably a bonus where rules were kept; but rent must be extracted, and failure to pay from any cause would result in prompt ejectment. Of course, such buildings would naturally have close attention from various charitable organisations, and cases of real hardship would be seen readily and dealt with adequately, as they cannot be at present.

Some precautions would be taken to prevent mean creatures (able to afford better accommodation) living there merely for the sake of the low rents. The dwellers would be under certain disabilities. For instance, it is a most difficult matter, but I should say that family life, without satisfactory evidence of actual marriage, would be prohibited. Widowers and widows with families would be accommodated, but in entirely distinct blocks.

Then, again, dwellers in these homes would, for the current year, forfeit their votes, at anyrate in municipal affairs; indeed I may, in passing, emphasise my belief that all who are employed and paid by the city for municipal work should have no vote in municipal elections—should have no municipal "pull." As to the style of buildings, they would be the plainest possible, of the stoutest materials, easily scoured, fumigated, and disinfected, with a minimum of fittings and maximum of strength, though not like barracks; each block sufficient for one caretaker and his wife to control and no more; on the balcony system, and therefore easily inspected, and well lighted at night; indeed, the entrance to the buildings should be locked up, and all put upon the *concierge system* after a certain hour. Such houses as these I

think the Corporation should build and manage, even at a loss; they would come in where it becomes impossible for private enterprise to build, and would house those who would otherwise become a burden on the community. Finally, I think they should be erected in advance of demolitions, and not delayed till the value of the remaining slums is increased by their increasing rental.

I know well that many objections will be raised to what will be called a wild proposal. It will be said that it is not thought out; that slum owners will not eject their bad tenants; that you can never eliminate the good and the bad; they are constantly crossing the dividing line; that it would never do to attempt to house the vicious and dissolute; that to make the theory effective it must be universal in application, and this would be far too costly; and, finally, that, by making one section of the community pay part of the rent of another, you are so far doing a flagrant injustice, and tending to pauperise the dwellers in city houses.

But to this I humbly reply that I am suggesting an experiment, throwing out an idea as a contribution to the problem, and as worthy of consideration and inquiry. I say that the erection of such shelters is the logical corollary of the essential policy of firm control. There must be some place for the people to go, and the rehousing of the struggling poor, displaced by the advance of sanitary science, must now be seriously undertaken—the worse the dispossessed people are, the more urgent the need to house and supervise them. If the scheme I advocate gives any reasonable prospect of extricating the good from the bad and housing both in decency, surely no expense need be grudged in making the experiment—if not in simple justice, then in self-defence. For the insanitary and overcrowded houses of the lowest class are terribly costly and terribly dangerous; they are the very plague centres from which moral and physical infection is spread abroad and perpetuated. We must remember that society is an organism; all sections are interdependent.

It must be borne in mind that, owing to the discipline suggested, few houses would suffice; while if the lines of experiment required to be changed, the character of the buildings could readily be somewhat altered, and I have no doubt they could be let to ordinary tenants at increased rents quite adequate to pay fair interest on the outlay. The amount of risk which the community would be running in erecting experimental blocks of such houses

is, therefore, comparatively small, as the loss would not be perpetual, but could at any time be cut short.[30]

Of course, it is the foundation of my scheme that these "rejected" tenants should be compelled to pay rent. It is only when they cannot pay their rents, or cannot satisfy any charitable agency that they are worthy of support, that the workhouse door may be opened to them. Wherein, then, would it pauperise them? Has it not the opposite effect? By compelling them to earn their bread, *spend less on drink*, and pay their rent, they are prevented from becoming a charge upon the rates or a burden upon society in some other way.

There is no interference with private enterprise, and no suggestion of the city requiring to provide houses for all its inhabitants. My suggestion is restricted to those helpless ones

---

[30] Let us see what is involved in the question of cost. There are slightly over 21,000 ticketed houses of one and two rooms in Glasgow, and this may be taken to be the class of house to be either renovated or superseded. Those houses contain a large number of decent, kindly people whose circumstances are straitened, and who are unable to afford higher rents. Let us assume, for argument's sake, that the dissolute and troublesome class occupy one-third of these houses, and amongst these are the members of the criminal and utterly hopeless class, whose actual numbers, I think, it will be found, are wonderfully small; say that we have to ultimately provide for from 3,000 to 5,000 houses, of which, of course, only a small portion would be applied for at first. Take it at 1,500 rooms, at a cost per room, including ground and buildings, of, say, £100 per room, giving a total of £150,000, which can be borrowed by the Corporation at a little over 2½ per cent., but provide, say, for 3 per cent., including sinking fund. The rents will not be high, but assume that the whole of the rents received were required for taxation, repairs, and management, and that, I think, looking to the experience elsewhere, is a liberal allowance. Indeed, such buildings, on proving that their scale of rental per 1,000 cubic feet was sufficiently low, should be exempted, not only from municipal, but also from imperial taxation. Assume, however, that there is no surplus for payment of interest, still that interest at 3 per cent. would only amount to £4,500 per annum, or a rate of one-eighth of a penny per £ upon owners and the same upon occupiers. How small a sum, after all, for the decent housing and efficient control of, say, 1,500 families, or, on an average at least, 4,500 souls? What a small proportion of the enormous sums expended in police rates and poor rates?

To put it shortly, it seems to me that, with a contribution from the rates of, at most, 20s. per person housed, or about £3 per family per annum, decent, though absolutely simple, shelters might be erected, in which many of the reckless and improvident class could be placed under control and forced to pay their rents.

who are such costly members of the community. We taxpayers, if we look ahead, will find that we will save a far greater sum of money in the matter of paupers and criminals in time to come if we honestly and fairly face now the decent housing of these degraded poor, rather than allow them to welter in disease, ignorance, and vice.

The more the house becomes the home, and the more ruthlessly are conditions of discomfort and disease removed, the more will the moral tone and the will power of the submerged tenth be raised and strengthened to fight against what are too often overwhelming temptations.

XVII.—The Evolution of Housing.

The attempts to deal with the housing question seem to me to resolve themselves into a progressive evolution, in four stages, something in this way:—*First*—destructive only—stern repression by the authorities of all insanitary conditions. *Second*—constructive—the provision for the respectable poor of decent houses, either by the improvement and renovation of existing tenements, or by building new houses on a 3 per cent. or 4 per cent. basis. I have described to you the slow growth of a movement in both these directions; how the policy of the Glasgow Corporation (which was at first confined to clearing away the dark dens of the city, and therefore destructive) has, through the enforcement of General Acts and the Police Act of 1890, become constructive, and now deals with the erection of new and the improvement of old buildings. As time goes on the futility of imperfect control will become more apparent, and then the authorities may find it possible to raise the standard of what constitutes an uninhabitable or overcrowded house, to abolish entirely "back lands,"[31] and something may become possible in restricting the occupancy of houses of one apartment.[32] The next logical stage, the *third* in the

[31] New York is leading the way in this respect. Early in 1896 the Board of Health inspected the "back lands" in that city, about 2,300 in number, about 500 of which were reported unfit for human habitation and were condemned. Of these, again, 87 blocks were closed during the year 1896. A test case heard during 1897 determined that no compensation was payable to the owners of such condemned buildings beyond the value of the building materials. "Annual Report of Board of Health," New York, Brown & Co., 1897, pp. 38, 69, and 389.

[32] See address by ex-Bailie Robert Crawford, Glasgow, to the Congress of the Sanitary Association of Scotland, August, 1894. *Sanitary Journal*, September, 1894.

evolution of this policy, is the increasing control and supervision, not only of construction, but of *management*, of all small houses, old and new; in other words, at all costs secure the expulsion of all bad and doubtful tenants by arranging closer co-operation between property owners and the sanitary and police authorities. The *fourth* (and, though the final stage at present, one which will yet be felt to be really the first and the predecessor of demolitions) is the provision of experimental houses at low rents for rejected tenants, for those who would otherwise be thrown upon the rates, or somehow become a burden or tax on the community—houses which, if they do not pay in £ s. d., will pay in other ways.

XVIII.—KINDRED QUESTIONS.

No one is better aware than myself of the fragmentary nature of my treatment of this subject, but it is so many-sided, and so interwoven with other problems—each requiring an evening to itself—that almost any treatment must appear fragmentary. When one attempts to condense into small compass the results of much hard thinking, he must take the risk not only of being dull, but also of being misunderstood.

Amongst other kindred subjects is, for example, the land question. The price of land is undoubtedly a great difficulty, but not greater than high wages of labour and increased cost of materials, while taxation of unbuilt land, in order to force down its price, will not confer much benefit upon the very poor, who must perforce abide where the land is all already built up.

Then, again, there is the delicate subject of premature, improvident, and reckless marriages. They have much to answer for, but it is enough to say that prudence in the marriage relationship is largely a matter of the standard of comfort. It is well-known that the underfed, badly housed, working people have on an average about twice as many children as those who lead lives of ease and comfort.

Others say the evil is in the drink; true, the drinking habit is a terrible curse, but it is both cause and effect. The unwholesome and over-crowded houses drive their inmates to drink, while the money squandered in drink would provide better houses. Indeed, it has been calculated that the publican receives three-fifths as much as the landlord, and that if the working man gave up drinking he could afford on the average to add two more rooms to

his house.[33] But the evil is to my mind in the abuse of drink, and excessive drinking cannot be stamped out in a day, or in a generation —we must reduce temptations and foster counter-attractions.

Further questions, well worthy of debate, include rapid transit to the outskirts, and schemes for enabling the workman to become his own landlord. These, however, do not affect the *really poor*, and I have endeavoured to limit the discussion to the policy of providing *for them* cheap and wholesome houses.

In so restricting the scope of my paper, do not misunderstand me. I do not look forward to help from any great changes in law, to any reconstitution of society, to any heroic or revolutionary measures; I preach to-night, however imperfectly, only the gospel of sanitation, measures of wise, sympathetic, but stern control—holding steadily in view the necessity both of municipal houses for the well-doing poor and also rate-aided shelters for the ill-doing poor—for most firmly do I believe that in time such houses would be found to pay, if not in £ s. d., at least in diminished disease, pauperism, and crime.

This policy will hasten and supplement the slow, but steady, work of religion and education; upon them we must rely in the final issue, and especially upon their influence over the young. In the children lie the hopes of the social reformers. As Professor Giddings says, "There is no better remedy for degradation than in a pure and sane family life."

And although I emphasise the solemn fact that as a man sows so shall he reap, and that if he will not work he shall be free to starve, I do not ignore the increasing need of kindly and personal charity, not only the charity of the cheque book, but personal charity, a well-directed and well-regulated benevolence. True philanthropy avoids all emotional tenderness to wrong-doing, gives no alms till the recipient has absolutely exhausted his own efforts and has failed, but gives freely of time and personal effort; aims at increasing moral stamina in the units with which it deals, and this it does by the creation of new aspirations, by arousing the spirit of self-reliance and self-respect, and oftentimes succeeds merely by the suggestion of opportunities whereby the downcast and despairing may take heart again and work out their own salvation, reaching in time a higher level of comfort, and a higher standard of efficiency in the battle of life.

[33] "The Social Condition of Labour." Professor E. R. L. Gould. Baltimore, January, 1893.

IX.—*Insanity in its Relations to Punishment for Crime.* By RICHARD BROWN, Professor of Mercantile Law, St. Mungo's College, Glasgow.

[Read before the Society, 15th March, 1899.]

IN the field of medical jurisprudence the lawyer and the physician meet on common ground. As a rule, the two great professions act in harmony and mutually assist each other; but in an important department of their joint studies, the century just about to close has witnessed a certain amount of friction which it should be the aim of every member of both professions to lessen, and, if possible, remove. This can only be done by a frank and friendly interchange of views—an object which I venture to think is not too trivial to merit the sympathy and co-operation of the Philosophical Society.

This "chronic feud," as it has been called, is the result of a series of fierce attacks by eminent medical men upon judges and lawyers, and even upon the general public, in so far as the public are supposed to sympathise with and support the law and its administration. "The relation of madness to crime," says Sir James Stephen, in his admirable history of the Criminal Law of England, "has excited a controversy between the medical and the legal professions in which many things have been said which would, I think, have been better unsaid. Cruelty, ignorance, prejudice, and the like, are freely ascribed to the law and to those who administer it, on the grounds that it is said not to keep pace with the discoveries of science, and to deny facts medically ascertained." The charges themselves are neither uniform nor consistent. They are not made by the whole medical profession, nor even by all "alienists," and not a few of the strictures are directed against the physician quite as much as against the lawyer. In the time at my disposal I must confine myself to a typical instance illustrative of the general position held by the class of medical men to whom I have referred. For this purpose I take Dr. Isaac Ray, an American author, whose work on "The Medical Jurisprudence of Insanity," written in 1838, is still frequently quoted in Europe as well as in the country of his birth. The most recent, and probably the most elaborate and exhaustive, work on the subject in the English language is that of Dr. Clevenger, of Chicago, published last year in New York, but, as

Clevenger is throughout a professed disciple of Ray, and constantly quotes him with approval, it is fitting that I should go back to the fountain-head, which half-a-century of medical investigation and discovery has not altered or improved.

Dr. Ray's argument is that "in all civilised communities, ancient or modern, insanity has been regarded as exempting from the punishment of crime, and vitiating the civil acts of those who are affected by it." He states, in so many words, that "the only difficulty or diversity of opinion consists in determining who are really insane in the meaning of the law," but Dr. Ray does not acknowledge that a real difficulty exists. The medical and the legal meaning of insanity are throughout all his reasoning taken as synonymous. In other words, every person pronounced by a competent physician to be mentally unhinged must necessarily be exempted from punishment. He denounces the law which prevents any one from managing his own property or making a valid will, by reason of his mental impairment, while treating that person as possessing all the elements of responsibility for criminal acts. He calls the distinction "preposterous" and the "height of absurdity," because, in his view, it makes more account of property than of life, but he fails to recognise that in protecting the property of a lunatic there is no danger to life, and that, as against the life of an insane person which he thinks endangered, there must be set the danger to the lives of every member of the community with whom the homicidal criminal comes into contact. Ray characterises as a "vague and senseless notion" the statement of our Scottish legal writer, Hume, that "it is not to be understood that there is any privilege of mere weakness of intellect, or of a strange and moody humour, or of a crazy and capricious or irregular temper and habit." Again, while approving of Alison's statement of the principle applicable to insanity as a complete bar to punishment, he objects to the addendum of that writer that "anything short of this complete alienation of reason will be no defence; and mere oddity of manner or half craziness of disposition, if unaccompanied by such an obscuring of the conscience, will not avail the prisoner." This Dr. Ray maintains is sufficient to show that Alison "in his struggle with the errors of the law had not completely emancipated his mind from their binding influence." Dr. Ray further points to the criterion of legal responsibility founded on the design or contrivance manifested in the criminal act as "additional proof,

if more were wanting, of the deplorable ignorance that characterises the jurisprudence of insanity."

In no part of this treatment of the subject are the extreme views of Dr. Ray and his school more manifest than in connection with what have been called moral insanity and uncontrollable impulse. Following Pinel, Gall, Rush, Combe, Conolly, Pritchard, and many others, Dr. Ray asserts, with probable truth, that the affective as well as the intellectual faculties are subject to derangement. Quoting Pritchard, he defines moral mania as "consisting in a morbid perversion of the natural feelings, affections, inclinations, temper, habits, and moral dispositions, without any notable lesion of the intellect or knowing and reasoning faculties, and particularly without any maniacal hallucination." Still quoting Pritchard, he describes the individuals affected by moral mania as "living at large and not entirely separated from society," but "reputed persons of singular, wayward, and eccentric character. . . . Individuals labouring under this disorder are capable of reasoning or supporting an argument on any subject within their sphere of knowledge that may be presented to them, and they often display great ingenuity in giving reasons for their eccentric conduct, and in accounting for and justifying the state of moral feeling under which they appear to exist." From a medical point of view, it may be open to call every eccentric insane, though the designation involves inconveniences which might at times come home to any one of us. But it is to be remembered that Dr. Ray is dealing with jurisprudence as well as with medicine, and that the task to which he has applied himself is to show that no insane person should, by law, be subjected to punishment. If every person subject to insanity in the sense referred to were to be freed from punishment there would be no longer need for judges or prisons, because there would be no crime, and hence no criminal law. Dr. Ray is conscious of the anomaly, for he endeavours, not very successfully, to distinguish between the moral insanity due to disease, and moral habits which can be attributed "to faults of education, to evil example, or to innate depravity." The latter class in Ray's opinion fully deserve punishment. It may be asked why is the sympathy of the physician lavished on certain moral delinquents, brought up, it may be, in social purity, and surrounded by every incentive to good conduct, while it is denied to the child of the habitual criminal, who, not to speak of heredity,

has been reared in an atmosphere of poverty, vice, and crime, and who has little or no conception of a higher life.

Under the general title "partial moral mania," Ray includes homicidal mania, or a propensity to destroy life. In this connection he discusses the doctrine of irresistible impulse, which he declares should in every case free the patient from responsibility for his criminal acts. It will readily be conceived that he is here treading on very dangerous ground, but it is fair to remark that he is supported by several recent writers, including some jurists, and notably Sir James Stephen. "No doubt," says Stephen, "there are cases in which madness interferes with the power of self-control, and so leaves the sufferer at the mercy of any temptation to which he may be exposed, and, if this can be shown to be the case, I think the sufferer ought to be excused." This would leave it open to any criminal to say, "My crime must go unpunished, because I could not help it," and, to meet this, Sir James introduces a distinction between "an impulse which you cannot help feeling and an impulse which you cannot resist." He classifies the influence of madness over the will under two heads. "In some cases," he says, "it furnishes a strong, but, at the same time, a *controllable* temptation to crime. Such are the cases of impulse to do harm in various ways which the sufferer struggles against, and in many cases overcomes. I cannot see," he continues, "why such impulses, if they constitute the whole effect of the disease, should excuse crime any more than other sudden and violent temptations." This argument seems to suggest that, if there is a mental struggle between good and evil, and the powers of evil ultimately prevail, the life of the individual is forfeited, but if there is no struggle, but an immediate abandonment to evil influences, no punishment can follow the crime. It seems as if the shattered remains of virtue form the destroying element. But who can tell the inner working of the mind? We must either accept unreservedly the criminal's own statement of his mental condition or leave the inquiry alone.

"Who made the heart, 'tis He alone
Decidedly can try us;
He knows each chord,—its varying tone,
Each spring,—its various bias;
Then, at the balance, let's be mute,
We never can adjust it;
What's done we partly may compute,
But know not what's resisted."

I have quoted Sir James Stephen because he only *partially* recognises the theory of irresistible impulse, but Ray and his school admit no similar qualification or exception. "Whether the individual," says our author, "has succumbed to the propensity to kill after a long struggle with his better nature, or has yielded to it at once and instantaneously; whether harassed by previous disease of body or despondency of mind, or apparently in sound health and with a cheerful disposition; whether his passions have been tamed by the discipline of a good education, or allowed to seek their gratification without restraint—they all possess one feature in common, the irresistible, motiveless impulse to destroy life." This position shows less subtlety and refinement than that of Stephen, and can be more logically maintained, but it is open to the same general objection. Admittedly we can only gain a knowledge of the mental processes of others by means of inferences from their language and conduct; hence the very enormity of a crime may in some cases shield the perpetrator from punishment.

It is remarkable that nearly all those writers who allow their sympathy with the individual wrong-doer to overshadow their sense of the public welfare make an exception in cases where the mental disturbance has been originally produced by the wrong-doing of the individual himself. "The fact of mental unsoundness admitted," says Ray, "it always remains to be determined whether it is of the person's own immediate procuring, or is the result of circumstances over which he had no control." Again, referring to drunkenness, he says it amounts in effect to temporary insanity, "but neither does this, any more than strong passions, exempt from all punishment; for the plain reason that in each case the impairment of moral liberty is the voluntary act of the individual himself." Stephen, in like manner, excepts from the protection afforded to the victim of irresistible impulse, all cases where the absence of the power of control has been produced by the person's own default. It is difficult to see why it should be so. To the ordinary observer there is no part of the existing law more open to criticism than that which condemns the criminal who acts unconsciously, and which treats drunkenness as an aggravation rather than an excuse for crime. It is passing strange that the sentimental school of criminologists, those who believe in retributive justice as administered by human hands, should be prepared to sanction a glaring outrage upon the principle that the punishment should fit the crime. For what is the crime? It is certainly not

the criminal act, for we assume that the perpetrator has no control, perhaps not even consciousness, of his actions. In the case of drunkenness the offence must be the giving way to the influence of intoxicants. On the principle of moral, as distinguished from legal, punishment, we must be judged by our intentions alone. But no one takes intoxicants with the intention of becoming a drunkard, much less with the intention of committing a grave crime. Those writers, therefore, are clearly inconsistent who insist upon insanity as an excuse for crime, and yet except cases of actual madness resulting from habits insidiously and certainly unintentionally contracted.

A passing reference to one or two other writers must suffice for this part of my subject.

In 1840, little more than a year after the first publication of Ray's work, Dr. Pagan, of Glasgow, published a small book under the same title, consisting, as he tells us, of the substance of lectures delivered to his class of forensic medicine. It shows evidence of much research and careful study, but, on the whole, it is a weaker work than that of Ray. The inferiority consists chiefly in the less skilful avoidance of some of the more obvious pitfalls to which his argument leads. Thus he almost invariably speaks of moral responsibility when he means legal responsibility, thus bringing into prominence the fact that these terms are deemed synonymous. Moreover, some of Dr. Pagan's ideas as to the tests of insanity are crude and imperfect, and would probably be repudiated by other exponents of the same general line of thought. Thus he tells us of a plan which, in concert with another Glasgow physician, he adopted for detecting feigned insanity. The man in question displayed peculiar hallucinations, along with considerable excitement of manner and occasional outbreaks of violence. He would refuse, for example, to take his food out of the vessels in which it was presented to him, but he threw it down upon the floor and sucked it into his mouth from the ground. The plan was to put the man suddenly into a real passion by presenting him with a draught of water, which it was known he would refuse, and then dashing it in his face. The gaoler who performed this service was instantly attacked, and the incidents of the struggle are supposed to prove that the person was only feigning insanity. "He continued," says Dr. Pagan, "to struggle for a considerable length of time, not like a maniac, who could not have combined two ideas together and who

would have been incapable of knowing the effect of combined movements, but his whole motions were those of a man who had assumed the best principles for overthrowing his antagonist, and who was quite capable of combining them in a manner the most likely to prove effectual. We left the prison," continues Dr. Pagan, "quite satisfied from this exhibition alone that the man was not insane." It would appear that Dr. Pagan's idea of an insane person was one incapable of combined muscular movement, but it would be an insult to the intelligence of my audience to proceed to show that if such were a test of insanity our asylums are filled with persons wrongly confined.

I cannot omit to refer to the works of Dr. Maudsley, particularly to his "Responsibility in Mental Disease," the fifth edition of which was published in 1892. It is many years since I first studied and admired Dr. Maudsley's writings. His style is trenchant and vehement, and his great experience and natural eloquence have in some cases given his arguments a force and weight beyond their intrinsic merits. Dr. Maudsley is impartial in his denunciations, and medical men and lawyers alternately come under the lash. The general position taken up is almost identical with that of Ray. Perhaps it is the very strength and pointedness of Dr. Maudsley's statements that lead the careful reader to detect the contradictions which abound, and impel him (if the book is his own) to disfigure the margin with marks of interrogation and exclamation. It would give me peculiar pleasure, did time permit, to follow Dr. Maudsley in detail, and to exhibit the strength, and try to expose the weakness, of his argument. But I must pass on to offer a few suggestions of my own on the general subject of this paper.

Much of the divergence of view between most medical men and most lawyers arises from the difficulty of defining insanity. The attempt has been practically given up in despair. There are certain extreme types of aberration from the normal average human being about which there can be no doubt, but the contention relates to a borderland which is absolutely incapable of precise delimitation. According to certain attempts at definition, one-half of mankind would necessarily be placed under the permanent care and custody of the other half. Not a few eminent medical men declare that all criminals are insane, and the perusal of any standard work on criminology gives force to the suggestion. Again, the test of sanity must bear relation to

the age in which the person lives, and the country in which he is born. Thus a believer in witchcraft would not have been insane in the seventeenth century, but might be treated as such at the close of the nineteenth. A follower of the Mahdi, who ruthlessly killed every European he met, and at last joyfully threw away his own life, would not be insane in Egypt, but similar conduct on the part of an Englishman in England would indicate acute mania. No merely physical test of insanity is available. The changes of brain structure, if such there be, are hidden from the human eye, and in many cases cannot be detected after death. The only practical test is the expression of the mental condition in the language and conduct of the individual, which, in the borderland referred to, is often a treacherous and arbitrary guide. Medical men, especially "alienists," claim, as experts, to be specially qualified to distinguish insanity, and are occasionally indignant at the admission of lay evidence. Undoubtedly they have peculiar claims to be heard with respect, but, if insanity is a departure from the average normal condition of man, the keen observer of human nature, not in its diseased, but in its normal state, has in many cases an equal, if not a superior, claim to be heard. At all events, it should be conceded that an average jury, after hearing such professional evidence as may be tendered, should be allowed to form their own conclusions, without any implied obligation to follow the *ipse dixit* either of physician or judge.

But the practical question relates not to insanity as a departure from the normal rule of mental soundness or health, but to insanity as indicating a line beyond which legal responsibility ought to cease. These two things are very different, though, as we have seen, they have often been confounded. If we were capable of correctly estimating motives or of forming moral judgments and inflicting punishment in expiation of offences, the exact shade of insanity would be of importance. It would require to be taken into account along with heredity, training, and surroundings, in meting out moral justice to the individual. But such an estimation is utterly beyond our power. Legal punishment cannot be justified as an act of moral administration or as a question of retributive justice. Its true basis is the safety and security of society, to which all merely individual interests must yield. Society has no right to inflict pain by way of punishment, except in so far as it conduces to the general well-being. "Punishment," says the elder Mill, "should be propor-

tioned, not to the greatness of the crime—that is, to the quantity of suffering it produces—but solely to the difficulty of creating an adequate motive to abstain from it; if a fine of one shilling created a sufficient motive to abstain from the crime of murder, the fine of a shilling would be all the punishment which ought to exist." "We punish a wilful and malicious offender," says Archbishop Whately, "not on account of his being morally more culpable than one who offends accidentally, but because wilful acts are the only ones that can be prevented by the fear of punishment. We punish a criminal on the same principle that we extinguish a conflagration to prevent it spreading, or destroy a mad dog that its bite may not communicate the infection."

Punishment may operate to diminish crime in three ways—(1) It may, by carrying out a death sentence or by perpetual imprisonment, render a particular criminal *unable* to commit further crime; (2) it may, by the reformation of a particular criminal, or by the dread in his mind of a renewal of punishment, render him *unwilling* to commit further crime; (3) it may deter others from committing crime by creating a motive to abstain in order to avoid being visited with similar punishment. It is upon the third of these that society has chiefly to depend for its protection. The criminal should be punished, to use the words of the old Scotch indictment, "that others may be deterred from committing the like crimes in all time coming." Upon whom, then, should legal punishment fall? The answer, says Lord Bramwell, is easy. The law "ought to punish all that it threatens, on conviction," and it ought to threaten "all who would be influenced by the threat, all whom it would or might deter or help to deter." True, the threat of punishment does not always deter mad people, but neither does it always deter men in their perfect senses. It is certainly not true that the threat of punishment *never* deters insane persons. "It does not," continues Lord Bramwell, "deter as often as it ought, because madmen are cunning enough to know that, from the way the law is administered, they can commit crimes with less chance of punishment than sane persons can. But to say that they are uninfluenced by the threat of punishment is to say what is contrary to everyone's experience and knowledge. How are mad people managed in asylums? Surely by the hope of some good or the fear of some harm according to their conduct." An anonymous reviewer of older date puts the matter thus—"If the mental incapacity of the person offending is so great that punish-

ment would have no beneficial effect by way of example on others in precisely the same mental state, then punishment would be suffering uselessly inflicted, and ought not to be imposed. But if the person doing the wrong, although he may not be perfectly sane, be yet in such a state as to be influenced in his conduct by punishment, and if punishment inflicted on him would serve to deter others in the same state of mind from the commission of crime, then punishment ought to be inflicted."

If, then, a person may be insane in the ordinary and medical sense of the term, and yet legally responsible for his criminal acts, where is the line of legal responsibility to be drawn? If an insane person is not, by the very fact of his insanity, rendered irresponsible, what degree of insanity is necessary to exculpate? This has formed a legal puzzle which the wisest heads have not been able satisfactorily to solve. I need not go back to such old-world legal writers as Sir Edward Coke or Lord Hale, and I am not concerned with the criticisms which have been poured so lavishly upon their *dicta*. They proceeded upon false assumptions, just as the medical men of their age acknowledged and founded upon witchcraft and demoniacal possession as explanations of the phenomena of insanity. There has never been in this country any solemn argument and judgment by a full bench of judges upon the relation of insanity to crime. There have been many directions by single judges to juries, but the most important trials have been remarkable rather for the speeches of counsel than for weighty judicial utterances. Thus the speech of Charles Yorke, Solicitor-General, in Lord Ferrers' case in 1760, and that of Erskine in Hadfield's case in 1800, discussed the subject in detail. Erskine's speech has been specially admired, but it is open to the criticism of Stephen that "it consists of that kind of emphatic and well-arranged ornamental commonplace which suits trial by jury, but shows no power of thought and no serious study of the subject." In 1843, however, a deliverance of all the English judges was extracted in rather singular circumstances. The popular alarm excited by the acquittal of M'Naghten, who murdered Sir Robert Peel's secretary in open day in the streets of London, under the mistaken impression that the victim was Sir Robert Peel himself, led to a debate in the House of Lords, as a result of which the House asked the judges collectively to return answers to certain carefully-framed questions. Fourteen out of fifteen judges concurred in the opinion delivered by Lord Chief Justice Tindal to the effect that no man had a right

to be acquitted on the ground of insane delusion unless he was incapable at the time of knowing that in committing the crime he was acting contrary to the law of the land. The answers were, however, so guarded by assumptions as to be practically worthless, except in so far as they indicated that only very grave mental incapacity would exculpate. Mr. Justice Maule, who gave a separate opinion, declined to answer the principal question explicitly, because, in his opinion, any answer involved a question of circumstances. But on the general question of responsibility he was even more emphatic than his fellow-judges. These opinions were not authoritative in the ordinary sense, since they did not arise in the course of actual judgment, and could not form a precedent. But they have nevertheless been constantly quoted as law by judges in England and in the majority of the American States. In Scotland they have also been received as to some extent authoritative. Thus, in 1855, the late Lord Justice-General Inglis, when Dean of Faculty, and addressing a jury on behalf of an accused person, expressed the opinion that the rule laid down by the English judges was "not only consistent with all legal principles and all common sense, but was nothing more than the ancient law of Scotland most admirably set forth." On the other hand, the opinions of the English judges have been bitterly attacked by medical men of the Ray-Maudsley school. The knowledge-of-right-and-wrong test, as it has been called, is at best a very imperfect one, but most of the attacks proceed upon the assumption that abstract right and wrong is meant, whereas the judges make it clear that their answers apply to the capacity of knowing right and wrong as embodied in the positive law of the land.

On the whole, it must be admitted that little real assistance is afforded by the judicial utterances referred to beyond the indication of a tendency to insist upon responsibility in every case where even moderate intelligence is displayed. This result, small though it be, is perhaps not without its use in leading to greater uniformity of judgment. Nothing is more striking than the chaotic mass of contradictory rulings in that minority of the United States where the opinions of the English judges are not accepted. But as an absolute test the rule of the judges must end in failure. We are, therefore, thrown back on the general principles applicable to punishment in the interest of the well-being of the community, and must trust to the good sense of the

judge and the jury, aided by such medical and scientific knowledge as can be placed at their disposal. In charging a jury in 1874, Lord Justice-Clerk Moncreiff said—"The question is one of fact. . . . The counsel for the Crown very properly said that this was entirely for you. It is not a question of medical science, neither is it one of legal definition, although both may materially assist you. It is a question for your common and practical sense." On this branch of the subject I have much pleasure in quoting Sir William Gairdner. He is speaking of sanity and insanity, but the remarks apply equally to legal responsibility and irresponsibility. "The line between them," he says, "cannot be very abruptly or definitely drawn. It is, therefore, not an affair of definition, nor even of doctrines, as to what insanity essentially is, but a question of practical adjustment, so to speak, between society and the individual, between the average sane mass (or mob if you like) of commonplace persons or Philistines, on the one hand, who control, and at the same time constitute, the social machinery, and the eccentric, abnormally good or bad, or otherwise peculiarly endowed individualities, on the other hand, dwelling within the protection of law, and therefore responsible to public opinion."

The greatest obstacle to a calm, legal judgment in the interests of society arises from the presence in society itself of strong personal or sympathetic feelings. An atrocious murder sometimes excites the public to fury, and so influences the jury as to exclude reflection as to the utility of the punishment which a conviction involves. The popular indignation arises from the natural feeling of anger against the perpetrator of a wrong upon an individual whose sufferings, or the sufferings of whose immediate relatives, are witnessed or sympathetically realised. It is, in a somewhat modified form, the same spirit of vengeance which characterised the criminal administration of rude ages and semi-barbarous nations. If the government even of a civilised country is not sufficiently strong to protect its own decrees, the popular feeling bursts the bonds of law, and expresses itself in the form which farmer Lynch introduced into Virginia. In a minor degree the same feeling sometimes manifest itself upon the bench. Thus there is a suspicion of some such influence when a judge addresses a homily to a convicted prisoner, and expresses his great regret that the law will not permit him to increase the punishment or subject him to the lash. But there is

also another side to the question. We may lose sight of the wrong done to the victim, and allow our sympathies to concentrate themselves upon the circumstances and surroundings of the criminal himself. "Those who act from feeling and not from principle," says Archbishop Whately, "are usually led to show more tenderness towards the offending than the unoffending—*i.e.*, towards the culprit who is *present* and the object of their senses, and whose sufferings and apprehensions they actually witness—than the absent, unknown, and undefined members of the community, whose persons or property have been endangered by him. We feel for an individual, especially if before our eyes, even though guilty; for the public, no one has, or can have, any feeling." If there is ground for a plea of insanity, the medical experts brought into immediate contact with the prisoner prior to, or in the course of, the trial, extend to him the same sympathy which they naturally and properly feel for a patient under their charge. Immediate contiguity may also sympathetically influence the jury, and may lead to a verdict, as in M'Naghten's case, which does not commend itself to the outside public.

One other suggestion I must hazard, more especially as it seems to offer a means of concluding a permanent peace between the two opposing sections of professional men. Many medical men would have their difficulties removed if capital punishment were abolished. Ray cites cases where an insane person, under the belief that the joys of heaven are in store for him, murders a fellow-creature in order that by means of human law he may the sooner enter upon full fruition of heavenly bliss. "Abolish capital punishment in such cases," says Ray, "and the delusion will disappear with it; continue it, and no one can tell when the latter will end." Maudsley is more general in his condemnation of capital punishment. "Abolish capital punishment," he says, "and the dispute between lawyers and doctors ceases to be of practical importance." Sir William Gairdner proceeds upon the same general lines. "Society," he says, "hesitates nowadays at inflicting the last penalty of the law, and in the opinion of many it has become merely a question of time when capital punishments are to disappear altogether." On the other hand, many doctors and lawyers defend the death penalty, particularly those of the Italian school of anthropologists. Lombroso attributes the greater humanity of our own age, in comparison with past ages, to the purification of the race by means of the penalty of death, while Garofalo cites

numerous statistics to show that in Europe crime has largely increased in countries where punishment has been mitigated. I am personally inclined to the abolition of the death penalty on condition that more effective steps are taken to protect the public, by keeping dangerous criminals, whether sane or insane, in life-long confinement. Perpetual seclusion is probably as severe a punishment as death, though its prospect may not be so vividly realised by the criminal. Against the fact that it may be weaker as a deterrent, we have increased security that the lives of the citizens will not be further endangered by the criminal in question. If a person is found to be insane, and has manifested a homicidal tendency, he should, on no account, be again let loose upon society. Experience has taught us that under conditions of restraint and care an inmate of an asylum may be exemplary in his conduct for many years, and yet when again sent back to society his dangerous tendencies may reassert themselves. There are many persons well known to be dangerous who are allowed to go at large because their eccentricities have not as yet passed into actual crime. It is not safe to trifle with the liberty of the subject, but, on the other hand, it is a standing menace to the public safety that any person who has given unmistakable signs of dangerous insanity should be allowed to develop his tendencies at the risk of the community.

If the death penalty were abolished, the only practical result from a finding of lunacy would be that the lunatic would be confined in an asylum instead of a prison. The effect, however, might be that a person not really insane might be confined for life instead of for a limited period. As an illustration of this possible consequence, I take a contrast arising out of the ultimate issue of two well-known cases—that of Oxford, who was tried in 1840 for shooting at the Queen, and that of M'Naghten, already referred to, who was tried in 1843 for the murder of Pitt's secretary. Both were found not guilty on the ground of insanity, and both were confined in Bethlehem Hospital. After Oxford had been ten years, and M'Naghten seven years in confinement, their condition was described from personal observation by a writer in *Blackwood's Magazine*. M'Naghten, according to this testimony, presented all the features of an incurable lunatic, while Oxford, during the whole ten years, had appeared perfectly sane, and had throughout spoken and acted in a rational manner. In conversation, Oxford strenuously maintained that there had

been no balls in his pistol, a point as to which there had been a singular lack of proof at the trial. When asked, "What made you do what you did?"; he replied, "Oh! I was a fool, it was just to get myself talked about and kick up a dust. A good horse-whipping was what I wanted." Then, addressing his interlocutor, he added, "Should you have done it if you had thought of coming here?" He had, in fact, expected a period of imprisonment, and while he admitted that he had been very fairly tried, he said, "I never expected to be brought in *mad*. I was quite surprised at that, for I knew I was not mad, and I wondered how they were going to prove it." Oxford's case gives point to the wail of some magazine writers, who complain of the injustice of finding a person not guilty, and yet refusing him his liberty after apparent recovery from insanity. But the public safety must be preferred to individual hardship, even could such be proved to exist, and it would be clearly unsafe to give way to such sentimental considerations.

I have not been able to do more than present in skeleton form some of the more outstanding points on which differences of opinion exist in regard to the relation of insanity to crime. It is a wide and intricate subject, and I shall be pleased if I have succeeded in presenting some materials which may form the basis of a useful discussion.

X.—*The Taxation of Land Values.* By JOHN A. TODD, B.L., Writer, Glasgow, Lecturer on Political Economy.

[Read before the Society, 22nd March, 1899.]

THE proposed taxation of land values is an economic question which has for some time had a peculiar interest to me. It was first brought under my notice as an elector in an East-end ward, where at every November election we are inundated with a flood of literature of a class familiar to most of you, setting forth a number of proposals for reform which claim to provide the solution of nearly all the economic difficulties of the day. Among these proposals the most worthy of notice is that for the taxation of land values.

For a long time the proposal was looked upon as only a fad of a small section of our municipal representatives, and as such it was simply ignored by those who ought to have exposed its weakness. But the tempting offer it held out to certain classes of practical immunity from taxation was enough to ensure it a warm welcome from them, so that it is only natural to find the agitation spreading to a higher platform. The proposal has now been adopted as an article of their municipal creed by many of our councillors who ought to know better, and who have done so, either from ignorance of the real merits of the proposal, or because they find it a good catch-cry at election times, while they salve their consciences with the assurance that the measure will never go any further. Be the causes what they may, the fact remains that the Corporation of Glasgow has first passed a resolution in favour of the taxation of land values, and then drafted, and, by a majority of four votes, adopted, a Bill to carry out the proposal.

In these circumstances I am most of all surprised and disappointed at the indifference shown by the members of my own profession to this question. There is no class whose interests will be more directly and deeply affected than the legal profession, and the building and investing classes whom they represent. At the same time, no class is in a better position to speak as to the real

merits of the question than lawyers. Yet it is no exaggeration to say that the great majority of the profession have never given the matter a second thought, and have dismissed the proposal as not requiring serious argument. I feel very strongly that the day for the adoption of that attitude is past—the question can no longer be ignored. It is time now for those who are in a position to speak of the true meaning of the proposal to let it be known. The progress of the agitation has been largely due to the want of authoritative refutation. Let that be forthcoming now, and I believe the proposal will never go any further.

The proposal to tax land values is only one of many proposals which may be included under the name of land reform. It is a common experience in discussing these questions to find that the supporters of the various land reforms are much given to changing ground, basing their arguments now on moral grounds, now on economic, at one time deploring the congested condition of the working-class population of our large cities, again accusing the land-owning classes of shirking their fair share of taxation, or again denying the right of any individual to own land at all, and so on. These different arguments which one has to meet are based on different economic foundations, but it is possible, on examination, to reduce them to two main categories.

There is, first, the more moderate view, which goes by the name of the theory of unearned increment. It is argued that the increasing value of land in large towns is due solely to the presence of a large population, and that this increased value—or unearned increment—should go to the community which creates it, instead of into the pockets of individual landowners or building speculators.

Second, there is the more extreme view that all private property in land is wrong—that the land belongs to the people. That is the idea of land nationalisation without purchase. Now, that is a proposition which does not require economic discussion. Land nationalisation without purchase is only another name for confiscation of private property, and that is a proposal I cannot for one moment entertain. If our consideration of the present question leads to the conclusion that the proposal involves any such result, then I have nothing further to say.

Let me, however, state the attitude I adopt to the former proposal, that the unearned increment of the value of land should go to the community. I freely admit the abstract justice of the

theory, that if there is, in the words of Mill, "a class in the community whom the natural course of things progressively enriches consistently with complete passiveness on their part," the increased wealth should go to the community, not necessarily because the community can establish any direct right to it, but because clearly no one else can. But I differ entirely from Mill in confining this idea to the value of land. Unearned increment is a phenomenon perfectly well known to economists in many forms. There are many cases of economic surplus or rent, which differ from land rent only in degree, not in principle. The larger earnings of a man of superior business ability are just as much a rent or surplus as the extra produce of a more fertile farm. These larger earnings are crystallised in the form of unearned increment when the man who earns them is the salaried manager of, say, a limited company, where the results of his superior business ability go to increase the dividends and raise the value of the shares of the company. The increased price of Coats' or Lipton's shares, for instance, is just as much an unearned increment to the holders of these shares as the enhanced value of Stewart & M'Donald's property at the corner of Buchanan Street is to them. It is true, of course, that the unearned increment in these cases is much more speculative and precarious, but Mill is in error in assuming that the unearned increment in the case of land is at all certain or universal. It is, generally speaking, true that the bulk of land in towns tends to rise in value, but there are many cases of particular localities where value has fallen, and this is generally the case in country districts. This, I think, would found a material modification on the sweeping character of Mill's proposal; but in the meantime it strengthens my argument that the phenomenon of unearned increment in connection with the value of land is exactly parallel with similar unearned increments in other forms of funded capital, and that there is no reason in principle why land should be selected for special treatment.

For our present purpose, however, I would be prepared, for the sake of argument, to admit the desirability of attaching this unearned increment of land value, though I shall have something to say of the practical difficulties of applying the principle. On the other hand, as I have said, I cannot entertain in any form the proposal to appropriate private property in land.

I wish now to consider this land agitation as we find it in Glasgow, to analyse the various forms in which it has shown

itself, and particularly that in which it appears in the present Bill of the Corporation. I wish to see how far that Bill rests on each of the two principles just referred to, and I hope to show, what may surprise you, that the proposed measure has nothing to do with the idea of the unearned increment; that, on the contrary, it is nothing less than a proposal to appropriate 10 per cent. of the income from all land in every city or burgh to which the Bill would apply.

Before going further, however, we must be precise as to the meaning of the terms we are to use, and, in particular, there are two terms by which I wish to be certain that you and I mean the same thing. The proposal we are to discuss is "The Taxation of Land Values." That suggests two questions—(1) What is the land value that is to be taxed? and (2) what is the taxation proposed to be placed upon it?

First, then, what is "land value?" To answer that question satisfactorily requires a rather technical explanation of the nature of our system of land tenure in Scotland.

All land in Scotland is, in theory, held from the Crown as ultimate superior or owner. Under the feudal system the land in the rural districts was parcelled out among the nobles of the time in return for military services, past and future, and they in turn subdivided it among their vassals on similar terms. In the towns or royal burghs the system was similar in principle, the land being held from the Crown by the magistrates for services rendered, known as "watching and warding," and allocated by the bailies among the burghers on similar terms. This was what was called "burgage" tenure.

With the advent of more peaceful times in our history we find the gradual conversion of these military services into money payments, and the development of our modern feuing system. The main feature of that system is one which renders it unique, and which at the same time has had much to do with the industrial prosperity of our country—that is, its permanence. The land is feued out by the superior to the vassal (or feuar) in consideration of a comparatively small annual payment called a feu-duty, which, once fixed, is perpetual. So long as the feu-duty is regularly paid, the vassal remains absolute proprietor of the ground. The feuar is thus the real owner—the superior has no control of the ground at all beyond the right to draw an annual payment from it. The advantage of such a system is

that it gives the feuar all the security of an English freeholder without the necessity for any large capital outlay in purchasing the ground outright. In burghs the development was similar. Much of the ground was sold outright to the burghers, and held by them for purely nominal considerations, which were almost never exacted, such as "one penny Scots, if asked only." Other parts, again, were given out under Contracts of Ground Annual for substantial annual payments approximating to the real value of the land at the time. This payment, called the ground annual, is almost exactly similar to the feu-duty, and since 1874 even the nominal distinction has disappeared, for, by the Conveyancing Act of that year, feuing of lands originally held burgage was legalised.

The result of all this is that the system of land tenure in a large city such as Glasgow is a heterogeneous mass of all sorts of holdings—different parts being held, some under payment of feu-duties, some under ground annuals, some under practically no burdens at all. In some cases the existing burdens are the full value of the ground, or even above it; in other cases they are very much under it; while in others again they are merely nominal.

The point I wish to bring out is, that in Scotch burghs like Glasgow there is no ready-made method available for fixing the value of land as distinguished from the joint value of land and buildings. In the Valuation Roll in its present form only two figures are given—the feu-duty or ground annual payable from the land, and the rental of the whole property, land and buildings together. We have seen that the feu-duty is no test of the value of land. There remains only the rental, and, as a matter of fact, rental is the only basis on which any practical man ever attempts to make a valuation, because rent-yielding capacity, present or potential, is the only real source of the value of land. The method of making a valuation of, say, a tenement of dwelling-houses, is perfectly well known. Take the rental of the property, and deduct from it the ground burdens, the rates and taxes, and a proportion estimated to cover repairs, which, of course, will vary according to the class of property, its age and stability, and the class of tenants. Then, having estimated the probable *nett* return, take so many years' purchase of that return, and there is your value—the number of years' purchase varying again with the class and condition of the property.

Now, that is by no means an easy or an exact process. What shall we say, then, of the proposed attempt to fix a value for the land on which the tenement stands as distinct from the buildings? On what basis can such a valuation be attempted? The rental is no guide, because the rental is for the whole property, and there is no possible means of telling how much is paid by each tenant for the use of the ground, and how much for the use of the buildings. Even when at present a valuation of unbuilt ground requires to be made, rental is still the basis of the calculation—the rental obtainable for the buildings which could be erected on the ground. If, then, you cut yourself off from rental as a basis of valuation, what have you left? Nothing that I can see but some purely arbitrary rule.

There is one plan I have often heard suggested, but which can, I think, be easily disposed of. It is said that the true value of land is the capitalised value of its rental *as agricultural land*, the difference between that and its market value being unearned increment—that is to say, this argument rests on the assumption that the true value of land in the centre of a large city is only the value of agricultural land on the outskirts of the city. But I would point out a grave fallacy contained in that statement. On what ground is it maintained that the value of agricultural land is in any sense a true or real value as opposed to the alleged artificial value of land required for building purposes? Is it not the case that the value of agricultural land, like any other land value, depends on rent, and rent depends on the price of agricultural products? High prices are due to the existence of a large demand, and that can only come from the proximity of a large population. So that the value of agricultural land depends on its position near a market, and is, therefore, just as truly an unearned increment as that of building ground in the centre of the city.

I submit, therefore, that there is no possibility of distinguishing between that portion of the value of land which is the real or true value and that which is unearned increment. All land value is, in a sense, unearned increment, because it is all due to demand. The element of cost of production practically does not enter into the question at all. We are thus forced to accept one of two alternatives—two extremes. We must either say that the value of the land is what it was originally in its wild state—that is nothing at all—or else we must take the present market value,

That brings us back to our first difficulty—"What is the present market value of land—how is it to be separated from the combined value of land and buildings?" As I have said, I can conceive of no principle on which the division can be made, no rule other than some arbitrary one.

The second question to be considered is—"What is the nature of the proposed taxation, and what is the necessity for the proposal?" Does it mean that land value at present escapes taxation, or is it simply an attempt to place increased taxation on land without similar taxation on other forms of wealth or income?

If the former be the idea at the root of the proposal, it is easily shown to be ridiculous, because, as we have seen, the value of the land is included in the value of the whole property, which is based on rental, and already all local taxation is imposed upon rental.

If the latter be the true object of the movement, then I say emphatically that it is directly opposed to the first principle of taxation—equality. Mill himself, a favourite authority of the land taxers, says that "a peculiar tax on the income of any class not balanced by taxes on the income of other classes is a violation of justice, and amounts to a partial confiscation." The object of this proposal is evidently to reduce other taxation at the expense of the landowners and landlords—that is to say, it is just the thin end of the wedge of the single tax on land. In short, it is not taxation at all, but appropriation of a portion of land value—land nationalisation by instalments, and without purchase.

With these explanations we pass now to the Bill as representing, presumably, the matured form of the agitation in Glasgow.

The proposals of the Bill are (first) to impose a tax of 2s. per £ on a sum equal to 4 per cent. of the capital value of all land in Scotch burghs, the tax to be paid by the proprietors; and (second) to shift the incidence of part of this taxation and make it fall upon the superior by allowing the proprietors of ground to deduct the tax of 2s. per £ from the amount of their ground burdens when paying these to their superiors. The proposals are therefore, in short, to tax feu-duties in the hands of the superiors, and to tax all land values (so far as they exceed the amount of the feu-duties) in the hands of the proprietors of the land. Let us look, then, at the principles involved in these two proposals,

which are really distinct and different, and, first, I should like to take the proposal to tax feu-duties or ground burdens generally.

This is a development of an old cry. Long before any one dared propose to tax all land values, the cry was raised, "Tax feu-duties," because it was alleged that they did not bear their fair share of existing taxation. Observe the difference between that cry and the present proposal, which is avowedly to impose additional taxation. In the discussions on the present Bill little has been heard of this old cry, because it is merged in the larger proposal to tax all land values, but it is still worth while noticing the arguments used in support of it, because they are often revived.

The argument was that there is an enormous annual income drawn from Glasgow and other cities by outside superiors in the shape of feu-duties. These superiors admittedly do not directly pay any share of local taxation in respect of that income, and that was supposed to be synonymous with saying that these feu-duties escape taxation. Notice, then, that this is an attack on superiors—the object of it is to increase the taxable value of the city, and the question comes to be "Are feu-duties taxed at present?"

For imperial purposes they clearly are as part of the superior's income, and a little consideration will show that they are also taxed for local purposes. Suppose a builder can erect a tenement of, say, eight dwelling-houses, at a cost for work and materials which would require £200 of rental to give him a fair return, that is £25 per house. If he has in addition to pay a feu-duty of, say, £24 for the ground on which the tenement is built, that is £3 per house, then the rental of each house will be £28—the feu-duty is included in the rent. Now, as all local taxation is based on rental, it is evident that feu-duties are taxed for local purposes.

But, it is argued, the taxation should be paid by the superior, not by the tenant. That may be so—we shall consider this later on—but it does not affect the present proposal, the object of which is to increase the taxable value of the city. If you make the superior pay this taxation you must take it off the tenant, and what have you gained by the transaction?

It is further argued, however, that there is a leakage under this system. There are large areas of ground in and around every growing city held up by superiors who refuse to feu except at rates

far beyond the present feuing value of the land, because they know that they will get these higher rates some day. It is said that taxation should be imposed on the present value of the land to penalise such holding out.

At the outset, I question the right to penalise a superior simply because he is holding out for a higher feuing rate than the present one. Remember that as the city extends its area of smoke and dirt it may destroy the agricultural value of the land long before it creates a new value by causing demand for building purposes, and during this period of *interregnum* the superior may get only a trifling return from his land. Again, it must be kept in mind that the feu-duty, once fixed, is permanent, while the value of the land is admittedly increasing. How can it be said, then, that the rate of feu-duties which represents the fair value of the land just now will always be the fair rate? Is that not self-contradictory?

This argument rests on the assumption that a man is not entitled to hold his property while it increases in value—that is, it involves the whole principle of the unearned increment. But, even admitting that principle for the sake of argument, how is the fair current rate to be fixed? Whatever rate you fix, superiors cannot get all their land feued at once at any price, and the result will be that they must pay taxes on a value which they cannot possibly get. It seems to me that there is only one way in which such a scheme could be fairly carried out, and that is by taxing superiors who are thus holding up land on a value which they have actually been offered and have refused. I could see the force of the arguments in favour of such a proposal, but I believe it would really defeat its own ends, for it must be kept in mind that the object of all this line of argument is to increase the taxable value of the city. Suppose, then, that this proposal were adopted, what would be the result? If effectual at all, it would mean that superiors would feu at a lower rate. That would imply that the builder could afford to let his houses at a lower rent, and in theory he would do so, with the result that the rental of the property would be permanently lower than it would otherwise have been. But that rental is part of the taxable value of the city, so that this would involve a permanent reduction of that taxable value for the sake of getting the taxable subject a few years earlier than would otherwise have been the case—that is, a permanent reduction for the sake of a temporary gain.

To this argument it will, I know, be answered that while a lower scale of feu-duties would reduce the taxable rental, which indeed is the avowed object of the proposal, it would lead to such an expansion of building as would far more than compensate the loss. This statement rests on an important assumption, namely, that in the case we are considering there is a large demand for dwelling-houses which could not be satisfied at the existing feuing rates. But that assumption cuts both ways, because if there were such an excessive demand, then, in spite of the taxation, the general level of feu-duties would not fall, but, on the contrary, the taxation would be passed on to the feuar in the shape of an increased feuing rate, and this would, in theory, involve a higher rent to cover the increased feu-duty.

So far for the theory on the point, but in practice there is little to be gained from any such attempt to establish a direct connection between the level of feuing rates and the general level of rents, or the amount of building. To begin with, the feu-duty is, after all, only a very small portion of the total cost of production of the buildings, and beyond that is the fact that the important element in fixing the scale of rental is not "cost of production" at all, but "demand." If more dwelling-houses are required, they must be got at any price; if they are not required, no amount of cutting of rents will make tenants for empty houses. We shall notice later on the effect of this in dealing with the proposal of the Bill as regards feu-duties.

The conclusion to which I would bring you meantime on this point is that existing feu-duties of land already built upon bear their full share of taxation, and that the proposal to tax unfeued lands would really be no advantage, unless the benefit were to be gained at the expense of increased rental, which is exactly the opposite of the intention of the proposal.

We return now to the second and much wider question, the proposal to place a new and additional taxation on all land values, including feu-duties, which are the superior's share of the land value. In fact, the proposal, as I have pointed out, is simply to appropriate ten per cent. of the land value.

The principle underlying this proposal (if there be any principle at all) must be that the proportion of ten per cent. represents the share of the present value of land in Scotch burghs which may be regarded as unearned increment. But I have already demonstrated the futility of attempting to make any such distinction or

allocation of the unearned increment. I maintain that if the principle of the unearned increment is to be applied at all, there are only two ways of doing it, according to the point of time from which it is to be calculated. We must either begin now and say that all future increased value of the land is to be treated as unearned increment, or else we must go back to the beginning, when land in its wild state was worth nothing, and count the whole present value as unearned increment.

There can be no hesitation as to which of these alternatives we must choose. To do anything more than attach future unearned increment would mean the appropriation of all land value, the confiscation of private property in land. That proposal, as I have already said, is one which does not require economic discussion. Be the right or wrong of it what it may, private property in land has been a recognised right for many centuries. The great majority of the present holders of land have bought it and paid for it, and to take away the whole or any portion of its value would be a gross breach of the first principles of equity and justice on which our constitution is based. Yet this is just what is proposed by the present Bill, for there is no room to doubt that if an annual tax of ten per cent., or any per cent., were imposed on all land values, the immediate effect would be a corresponding drop in the selling value of all land to the present holders. The taxation would simply be discounted by the fall of the present value of property, so that the whole burden of the capitalised amount of the taxation would fall on the present holders of land.

I believe the popular mind is very much misled on this point by an idea that the landlord classes, and particularly the land-owning classes—the owners of feu-duties—are a set of bloated capitalists, who can well afford and richly deserve to lose a portion of their supposed ill-gotten gains. Nothing, however, is further from the truth. The bulk of the property in towns, especially tenement property, and also of feu-duties, is held purely as investment, and by those classes who most of all require a safe investment, even at the cost of a lower rate of interest. The speculative builder does not hold his land, he builds and sells, and it is the purchasers from him, the testamentary trustees and the like, who can only accept absolutely safe investments, who hold these lands and feu-duties now. What shall we say, then, of the justice of a proposal which would destroy at one stroke ten per cent. of the income and the capital value of such investments?

In any case, I think it must be admitted that it would be particularly unfair to make the proposed taxation retrospective as regards feu-duties—that is, to impose it on existing feu-duties. The income of these is fixed for all time, and the amount of it was calculated without any hint of such a change as this proposed taxation. The price paid for them by the present holders was calculated distinctly on the footing of that permanent return. Those in receipt of that income have received no share in any unearned increment already accrued, and they cannot hope to share in any future advantage. Why, then, should they be penalised?

I say, then, that the only fair proposal would be to limit the taxation to future unearned increment. But, as I indicated, I foresee great practical difficulties in the carrying out of even that modified proposal. It would necessitate a valuation now of all the land in the city, and its periodic revaluation, say, every five years; and how is that to be done? I have already noticed the impossibility of laying down any guiding principle for such a valuation. The only method would be a prolonged litigation between the assessing body and the proprietor of every property in the city, resulting in a purely arbitrary fixing of the value according to the relative strength and skill of the parties. We have already plenty of experience of the nature and cost of such proceedings. Let me quote only one instance. An East-end builder proposed to demolish and rebuild certain old properties at the corner of two important streets. The building lines of the old properties projected a few feet beyond the new lines which had been established farther along these streets, and the Corporation wished that the new building should be set back to these new lines. The builder was willing to give the ground if he were paid for it, but when it came to the question of fixing the price the parties could not agree. After a long litigation before an arbiter, the builder was awarded £2,700, and the expenses amounted to £1,120 9s. 6d.

Now, that kind of thing all over is simply impossible. We would not be half-way through the first valuation before it would be time to start the next. There is no use in saying that it could be done just as easily as the present valuation returns. It could not, because the present valuation system is based on rental, an actual fact which can be definitely ascertained. Here there is no basis whatever, and there would be no possible carrying on of the

system except by laying down some purely arbitrary rule, which would inevitably be oppressive in particular cases.

Again, if this principle of the unearned increment is to be adopted, it must be balanced by a system of compensation to those owners whose properties, through no fault of their own, but owing to the movement of population, have depreciated in value. I do not think it is well enough known how common such cases are. I know of one case just now where a man bought a property in the centre of the city twenty years ago at the price of £2,250, and obtained a bond for £1,500 over it, paying the balance of the price, £750, out of his own funds. The property has recently been taken over by the Improvement Trust, under compulsory powers, at the price of £1,000, so that the owner, besides losing the money he put into it himself, has had to pay £500 to extinguish the remainder of the bond. In short, he has lost £1,250, and during all the time he has held it the property has never yielded as much as paid the interest on the bond. That is the other side of the picture, which is too often forgotten.

So far, then, for the principles which, I take it, are supposed to underlie the Bill. I return now to a more detailed criticism of its proposals.

In the first place, the Bill embodies the very worst fault of all—it is retrospective. It proposes to place the new tax on all existing land values, not merely on the future unearned increment. I have already pointed out that if the restriction of the tax to 2s. per £ meant anything at all, it ought to mean that ten per cent. is supposed to represent the proportion of existing land value which may be looked upon as past unearned increment. But I do not believe that any such idea ever occurred to the framers of this Bill. The restriction to 2s. per £ is only temporary, a question of amount. So far as the principle of the Bill is concerned, it might just as well have been 20s. per £. The Bill is simply a first instalment of the confiscation of land. Unearned increment has nothing to do with it. There is not even provision made for increased taxation on the future increased value of the land—the future unearned increment—an omission which has one very important advantage, it saves the necessity for making any provision for compensation in cases of worsement.

In the second place, there are certain objections to the machinery of the Bill. First of all, it only applies to Scotch burghs.

Now, a proposal like this proceeds on a general principle, which is equally applicable to all the land in the country, and it should be embodied in a general measure. The restriction to burghs would, I think, have a disastrous and unexpected effect in stopping almost entirely all further building on unfeued lands within their boundaries, for what builder would take a feu inside the city, where his property would be subject to this taxation, when he could get plenty of land outside of the city clear of such a burden. In this way the Bill would probably be futile from one point of view, because it would lead to a more rapid increase of feuing rates all round the suburbs of large cities, causing, of course, a large unearned increment to the value of these lands, and the galling thing would be that that increased value would never, even when the land was built upon, become amenable to the city taxation, though directly due to it. I can well understand, however, why the promoters of a land reform based on the unearned increment idea should be anxious to confine the scope of their legislation to the large towns, and perhaps the immediately surrounding districts, because it is only in these that there is really any unearned increment at all. In the country districts it would be nearly all the reverse.

Further, the Bill makes no attempt to lay down a principle for fixing the land value. The provision is that every proprietor of any land or heritage in any burgh in Scotland shall state the annual value of each such piece of ground, calculated at the rate of four per cent. per annum upon the sum which such proprietor may fix as the price thereof "as between a willing seller and a willing buyer." I challenge any man to say what that means as a practical guide to any one trying to arrive at a valuation of building ground.

There is another omission from the Bill which would lead to a very unfair anomaly. I have argued that the proposed taxation under the Bill is really appropriation. It is only fair, therefore, that the part of the value so appropriated should be exempt from taxation, but no such exemption has been provided for in the Bill.

It now only remains for us to look forward and try to forecast the probable effects of this Bill if it became law.

In the first place, it would mean, as we have seen, an immediate fall of ten per cent. in the value of all lands and feu-duties in the hands of the present holders. That would certainly act as

a very serious check on the whole building industry, and it would probably be enough to cause a crisis in the trade, with the inevitable serious effects on all other industries of which we had experience twenty years ago.

To set against this, what good might the change be expected to effect? It would probably increase the revenue from taxation, but I am certain that the increased revenue would not be nearly so great as the loss to the owners of land, because the dislocation of trade would have serious effects on the whole fiscal system.

It is not, however, merely for the sake of increased revenue from taxation that this reform has been so eagerly desired. One of the main contentions has always been that to penalise the holding up of land by imposing taxation on unfeued land would force the superiors to feu at a lower rate, which would enable landlords to let their houses at cheaper rents. But would the proposed taxation have the effect of reducing feu-duties? I think not. On the contrary, it would, in my opinion, either have the effect of increasing feuing rates, because the superior would discount the taxation in that way, or else it would in all likelihood put an end to the system of feuing altogether, and in its place we would find the development either of a leasehold system or of a system of sale outright. It would be very easy for superiors to refuse to feu any more land, but instead to sell it outright, and take payment of the price, or part of it, by a bond over the property, bearing interest at a rate which would equal the amount of the feu-duties formerly demanded. Thus the superiors would escape payment of the taxation altogether, and the whole burden would fall, in the first place, upon the builder, and ultimately on the tenants.

In the second place, would the proposed taxation have the effect of reducing rents? The answer to that question, I think, is clear and not far to seek. It might have this effect at first, in consequence of the fall in the value of property which would probably follow, but this would be merely temporary. Economic laws cannot be altered by Act of Parliament. The sole cause of high rents is excessive demand for house accommodation. No such proposal as that contained in this Bill can affect that principle. Rents would go up higher than ever, because the taxation would check all building and cut off new supply of houses, with the result that the landlords would pass the taxation on to the rents, and recoup themselves at the expense of the

tenants. Therein lies an essential weakness of the Bill. Higher rents would, of course, mean increased value, but there is no provision in the Bill for appropriating future unearned increment. The increased value means increased taxation, but the taxation is only ten per cent. of the increase, so that it would pay the landlord well enough, and the increased taxation would, in turn, like the original taxation, be passed on to the tenants in the shape of further increased rents. So the circle would go on. As long as you leave the landlord a single shilling in the pound of his land value, you leave him the power of recouping himself at the expense of his tenants. I say, then, that in the absence of a provision for the appropriation of the whole of the future unearned increment, the Bill would fall short of its chief end—the cheapening of rents. On the contrary, the taxation would be added to rents. There is only one other way to meet this, by increasing the proportion of the land value which is to be appropriated by taxation until the maximum of 20s. per pound is reached. I maintain, therefore, that the logical conclusion of the Bill as it stands is taxation to the full extent of 20s. in the pound; in other words, confiscation of all private property in land.

The conclusion to which I am forced to come upon the whole matter is that the Bill has been smuggled through the Corporation on false pretences. I refuse to believe that our municipal representatives are so far wanting in the first principles of fair dealing as to pass knowingly a proposal based upon such a gross injustice. It seems to me that the Council has been won over to the abstract principle of unearned increment, and then this Bill, which has nothing to do with unearned increment, has been foisted upon them. I think our citizens—the sensible and just-minded portion of them at least—have only to realise this to put an end to the agitation. If once they come to understand the real nature of the proposal, that it is nothing else than the thin end of the wedge of the confiscation of all land values, I am confident that the Bill will be at once, and once for all, relegated to the limbo of obscurity that such a measure deserves.

XI.—*The Workmen's Compensation Act, 1897 (as bearing on the Building Trade).* By JAMES A. LOVE TINDAL, Writer.

[Read before the Architectural Section, 13th March, 1899.]

I FIND myself in the somewhat curious position to-night of having undertaken to address you on a subject of which I confess I know very little, and of which I don't think any one knows, or at present can know, very much. Although the Act only came into operation last year, quite a number of treatises explanatory of its provisions have been written; but while these treatises are, for the most part, written by men of great ability and mature experience, and while they do doubtless contain many helpful suggestions and explanations, they cannot, and do not, pretend to afford practical help as to the final interpretation of the various sections of the Act, which will only receive their authoritative interpretation from the judicial tribunals of the country in years to come.

It is difficult to deal with such a subject in an attractive way, as it does not, to any extent, lend itself to the æsthetic or sentimental treatment available to your Society when discussing the architecture of days gone by, for then an essayist, while affording interesting instruction in a purely professional and technical sense, may quite properly take occasion to narrate brave stories which tradition has interwoven with the history of the cathedral, castle, or abbey which he describes. This Act does not even allow me to refer to the taking down or restoration of a ruin unless it is at least 30 feet high.

A brief survey of the legislation of our country applicable to employers and workmen, or masters and servants, is exceedingly instructive and interesting, as showing how social views on the connection between capital and labour have changed and progressed and developed, until now, upon considerations of public duty and State policy, workmen are practically insured against accident at the expense of their employers, and, consequently, of the public. In order thoroughly to understand the present, we must try to

glean from the past its rich fruits of experience, and having, with the help of this experience, faced and measured the problems and responsibilities of the present, as the result of to-day's legislation, we may find ourselves in a position to predict more or less accurately the future. It will, therefore, be convenient, in discussing with you this subject, if I group my thoughts under three heads, viz. :—(1) *Retrospect;* (2) *Present Experience;* and (3) *Prospect.*

(1) *Retrospect.*—Prior to the year 1880 the right of a workman to recover compensation for injury sustained in the course of his employment was based on the common law of the country. Each party had made his bargain, and the legislature did not interfere to modify or restrict that bargain. It is interesting to notice that, under the common law, the terms "master" and "servant" were almost invariably used, while nowadays we talk of "employers" and "workmen." The change in the terms is, of itself, interesting, and indicates the development of the more modern theory that the employer is not necessarily a superior *man*, that he is only the person who provides work; while the workman is not necessarily an inferior *man*, that he is the person who performs work provided for him to do. In bygone days the term "master" had in it much more definitely than it now has the idea that he might exercise an arbitrary and unlimited control, expecting and compelling obedience; while the term "servant" equally involved the idea of docile and unquestioning submission to control, not only in the nature of the work to be done, but also in the way in which it was to be done. Times are changed, and we can imagine the astonishment with which a master of 50 years ago would view the independence and influence now possessed by the British workman. I cannot to-night explain the main principles of the common law in detail, because the general duty of an employer to his workman is as varied as are the circumstances and conditions and nature of the work to be done, and cannot be limited by the practice of any particular trade or calling. I am most anxious in this retrospect to give you a brief general view of the common law stripped of all technicalities and legal phrases, and I will therefore cite a few illustrations which involve the most noteworthy principles. A miner in the employment of a colliery company* was being drawn

* Bartonshill Coal Company *v.* Reid, 3 Macq. (H.L.Sc.), 226.

up from the pit in a cage. A fellow-workman failed to stop the engine as soon as the cage arrived at the platform. The cage was in consequence overturned, and the miner was killed. The representatives of this deceased man cannot recover anything at common law. Why? Because the accident was due to the risk of the employment. The miner accepted the employment knowing that he was exposed to this and innumerable other risks. "When several workmen engage to serve a master in a common work, they know, or ought to know, the risks to which they are exposing themselves, including the risks of carelessness, against which their employer cannot secure them, and they must be supposed to contract with reference to such risks." Again, a person in the employment of a railway company* was injured by another person in the same employment, but engaged in different duties, and while they were both engaged. At common law he cannot recover anything. Why? Because he was injured by the fault of a fellow-workman. This is a further example of the principle established not only in this country, but in England, Ireland, and America, that a servant, when he engages to serve a master, undertakes, as between himself and his master, to run all the ordinary risks of the service, including negligence of a fellow-servant (however high or low his grade may be), when he is acting in the discharge of his duty as a servant of him who is the common master of both. But take another case, that of an employer going with a lighted lamp to detect an escape of gas, and before the gas was turned off at the meter, explosion results, and a servant is injured. At common law the servant is entitled to damages against his employer. Why? Because an employer is liable for the result of his own carelessness and negligence to use reasonable precautions. Again, the machinery, tackle, or material supplied for the work must be sufficient; the workmen employed must be competent; and, generally, the employer must take care not to increase the risks of the employment by any want of care, or by neglecting to observe any statutory requirements applicable to his trade. On the other hand, the common law presumption is that a workman enters on his employment with full knowledge of the risks which he may encounter where such risks are apparent, and so accepts the risks of the employment.

Take another point.† When the Crystal Palace in London was

* Hutcheson *v.* York, &c., Railway Company, 1850, 5 Ex., 343.

† Wiggett *v.* Fox, 1856, 11 Ex., 832.

being built, the contractors sublet part of the work, and one of the sub-contractors engaged a workman. This workman was paid by the contractors, who had a control over and power to dismiss him. He was injured while engaged in the work by a workman engaged by the contractors. He was held not entitled to bring an action against them, because he was injured by a fellow workman. It is right to say that the soundness of this decision has been much questioned, and nowhere more than in the leading case of Johnson *v.* Lindsay, 1891, Appeal Cases, page 371. In this case builders contracted to build a block of houses under a specification prepared by the owner's architect. Provision was made for certain fire-proof portions of the houses being executed by the defenders, who were ironfounders. The defenders contracted with the architect direct to do their portion of the work, and had no contract with the builders, and were not under their direction or control. While the defenders were carrying out their contract, workmen employed by them in raising concrete to the upper storey of the building negligently let a bucket fall on the pursuer, who was working in the lower storey, in the employment of the builders. It was held by the House of Lords that, since the relation of master and servant did not exist between the defenders and the pursuer, the doctrine of collaborateur (common employment) did not apply, and the action was maintainable. Here, you observe, the negligent workmen and the injured man were not fellow-workmen. They did not serve the same masters. Their respective employers had separate contracts with the architect. Had the builders employed the ironfounders to do the work, the defence of common employment would probably have been sustained, and the injured man would have been unable to recover. Contrast with this a case in which a railway company* employed a contractor to unload coal trucks. The contractor engaged his own men and exercised all control over them. One of the men was injured by the improper shunting of an engine bringing coal trucks to a siding. Can the injured man recover from the railway company? Yes, because the negligent shunter was not his fellow-servant. I cannot stay to-night to say anything regarding the effect of negligence or contributory negligence on the rights and responsibilities of servants and their masters. That might well form the subject of a complete treatise. From what I have already briefly

* Turner *v.* Great Eastern Railway, 1875, 33 L.T. (N.S.), 431.

stated you may have gathered, more or less accurately, an impression of the rights of injured workmen to compensation from their masters at common law. These common law rights, such as they are, still exist, but in the year 1880 the Legislature stepped in and set up a standard of duty independent of contract, and provided that the law should imply more generous conditions of employment, and it will be useful for us to try and summarise the important changes wrought by the Employers' Liability Act, 1880.

The passing of this Act marks a very definite stage in the development of social ideas relative to employers and employed, and in this Act you will not find the terms "master" and "servant." "Jack is as good as his master" (although he has not the money) is the doctrine that is being ever more and more emphasised, and now that Trade Unionism has become an important, if not a dominant, factor in the industrial commonwealth of our country, and that workmen have found effective means of compelling attention to their clamant demands, it is perhaps as well that many large employers act on the principle that the interests of their employees are their interests, and that only by friendly co-operation and mutual consideration can the most profitable results be attained for all concerned.

Now, to make a long story short, what was the object of this 1880 Act? I told you that at common law one of the principal defences to an action available to an employer was that the injured man had been injured by the fault of a fellow employee, whatever the grade of that employee might be. The 1880 Act, in certain circumstances which it specifies, and which I cannot stop to detail, removed that defence. The Act in such circumstances* put the workman suing into exactly the same position as if a member of the public had been suing, and limited the amount of damages which he might recover. At common law, as we have seen, the employer has numerous defences to an action. The 1880 Act† allows him to retain these defences, but denies to him the special defences which he formerly had when sued by one of his own workmen. This Act was, of course, the result of the resistless pressure of public opinion, and it is interesting to note from the dicta of some of our judges that, while interpreting its provisions with stern impartiality, they felt the necessity of giving in doubtful cases a beneficial construction

* Morrison *v.* Baird, 10 R., 271 and 278.

† Weblin *v.* Ballard, 172 B.D., 122 and 125.

in the interest of the workman. There are many provisions in the 1880 Act to which I might usefully advert; but as I have mentioned it merely that you might note it as marking a decided advance, if a transition, in the legislation on the subject, and as my chief object is to tell you something about the 1897 Act, I must dismiss the 1880 Act in a couple of sentences. The Act limited the amount of compensation recoverable. Such compensation was not to exceed "the estimated earnings during the three years preceding the injury of a person in the same grade employed during those years in the like employment and in the district in which the workman is employed at the time of the injury." Notice of action must be given within six weeks, and the action itself commenced within six months from the date of the accident, or in case of death within twelve months from the date of death. The 1880 Act was, no doubt, well meant, but I suppose it has occasioned expensive litigation, and swelled the bulk of our law reports to a greater extent than any other single Act in our Statute Book. It has not yet been repealed, and it will probably in the future be much resorted to where aggrieved workmen consider that their interests have not been sufficiently provided for by

THE WORKMEN'S COMPENSATION ACT, 1897,

which I shall now ask you to consider.

This Act came into operation on 1st July, 1898, and you will naturally want me to tell you in a few plain words what the objects were of an Act regarding which even the man in the street talks fluently, and which was expected to revolutionise the relations of employers and workmen, and make the fortunes or compass the ruin of our accident insurance companies. This Act is probably but the commencement of a system of compulsory restrictions on the freedom hitherto exercised by employers and their workmen, and we may expect further legislation extending and emphasising the principles which it promulgates. Already lawyers are talking of its amendment, as it has been found faulty in various respects. It is not now open for an employer under this Act to make any contract he pleases with his workmen. He cannot now, except under conditions which I will immediately explain, make an agreement with an employee to the effect that, so far as their relationship is concerned, the Act will not apply. The 1880 Act contained no provision to prevent or render in-

effectual this "contracting out," but the 1897 Act shows a definite development of the notion that the State has a duty imposed upon it to regulate the conditions of labour. It will not allow an astute employer to bind down his employee to conditions which might prejudice his new-found rights. Formerly, as I have pointed out, the relation of employer and workman was interpreted according to the ordinary law of contracts—"a bargain is a bargain," said the common law. "Not exactly," said the 1880 Act, and it proceeded to assimilate the position of a workman to that of a stranger by applying a test to the conditions of the employment other than the contractual one that had up to that time been exclusively resorted to. The 1897 Act goes further, and that in a new direction, by practically insuring the position of the workman at the expense of his trade, and this, of course, ultimately comes to be at the expense of the community supplied by the trade.

I should, perhaps, explain that, if an employer desires that his employees shall not come under the provisions of the new Act, he may, under Section 3, substitute some other scheme providing for their compensation, but the substituted scheme must be certified by the Registrar of Friendly Societies to be not less favourable to the general body of workmen and their dependents than the provisions of the 1897 Act. The certificate granted by the Registrar is valid for five years, but is subject to revocation. It is interesting to know that already many large employers have availed themselves of the provisions of this section.

Prior to the passing of the 1897 Act the question of liability depended sometimes entirely on the answer to the question, "Who is in fault?" That question has now no importance, unless the injured workman has himself been guilty of "serious and wilful misconduct." It would be quite correct to say that the law of compensation to workmen has become a branch of the poor law; but instead of the ratepayers being responsible for the maintenance of an injured workman, the employer is. The compensation provided for is not viewed as a *penalty* payable by the employer, but as a necessary provision for the workman. The State says that one of her sons has been injured, and must be provided for until he is restored to health and strength. That is the root idea running through the Act. Another idea seems to be that the compensation is to be ascertained and paid as quickly and cheaply as possible, and that without the adoption of legal proceedings or the intervention of

lawyers. This result has not yet been attained, and will not probably soon be, unless we can find some means of bringing human nature into conformity with Acts of Parliament.

Perhaps I shall more happily suit your convenience if, instead of taking this Act section by section, and endeavouring to show you in what respects it specially interests you as architects and builders, I submit to you a few examples of real or supposed cases which show how in various circumstances the provisions of the new Act would be applied. You will readily understand that I have no large store of case law to which I might resort, and that I am, like every one else who cares to acknowledge it, but feeling my way in enunciating the provisions of the Act and endeavouring to make clear to you its principles. Now I desire, if I can find suitable illustrations, to confine myself to circumstances which may arise to-morrow in the practical experience of you all in the exercise of your profession or trade. Before I proceed with these cases, might I ask you to note very specially that the Act applies only to "employment by persons undertaking the construction, repair, or demolition of a building *which exceeds 30 feet in height*, and is either being constructed or repaired by means of a scaffolding or being demolished, or on which machinery driven by steam, water, or other mechanical power is being used for the purpose of the construction, repair, or demolition thereof."

Now, if I am to be helpful to you at all to-night, it will be here. I think it will be your pleasure that I should confine myself somewhat strictly to the section I have quoted, as it is here we enter the province which you claim as your own, and comprehended by which you may expect circumstances to happen in the every-day pursuit of your calling. I shall take the section to pieces for the sake of clearness.

> "Employment . . . . on, in, or about any building which exceeds 30 feet in height, and is either being constructed or repaired by means of a scaffolding."

Here you naturally face me with the questions—"What is a building 30 feet high?" "What method of measurement must we adopt?" If we go to the London Building Act, 1894, we find that height in relation to any building means "the measurement taken from the level of the footway (if any) immediately in front of the centre of the face of the building, or (when there is no such footway) from the level of the ground before excavation to the level

of the top of the parapet, or where there is no parapet to the level of the top of the external wall, or (in case of gabled buildings) to the base of the gable." Now the arbitrator, under the Workmen's Compensation Act, 1897, will clearly not be entitled to adopt any method he pleases of determining the height of buildings. I cannot find in the Act any indication of any particular method of measuring, and no assistance seems available from common law as to the level from which height is to be measured. Are you to take the street level, or the basement, or the foundation as the terminus of your measurement? I cannot dogmatise here. I think, to set doubt and speculation at rest, this point will have to be dealt with by the appeal courts, and probably an arbitrary rule will be established.

By way of illustration take a case decided on 19th November, 1898. A labourer was in the employment of a builder who was erecting a building under a contract entered into with the proprietor. The building was to take the place of one which the contractor had demolished previously, and, when completed, would contain four storeys and be over 30 feet in height. The new building was being erected by means of scaffolding; and during the course of the operations a brick fell on a labourer's head and seriously injured him. At the time when the accident occurred no part of the building exceeded 30 feet in height. The highest point, *measuring from the basement*, was 30 feet. It was held (affirming the County Court judgment) that, as the building at the time of the accident was not more than 30 feet in height, the Act did not apply. It was contended for the injured workman that the Act applied if the building in course of erection was, when finished, to exceed 30 feet in height. The Court did not accept this argument, and, I venture to think, rightly rejected it. The words of the Act do not seem to leave any room for doubt, "any building *which exceeds 30 feet in height.*" To give this section the meaning argued for by the pursuer would be equivalent to adding the words "or which may hereafter exceed 30 feet in height;" and no judge, however anxious he might be to give a liberal interpretation, could go this length. Until the height of 30 feet is exceeded, the 1897 Act will have no application to the building. Up to that point the rules of the common law and the Employers' Liability Act, 1880, will apply to regulate the liability of employers. By way of contrast, take the case of a building being demolished. When operations are commenced it

is 100 feet high—when an accident happens it is 29 feet high. Can the workman recover? I am afraid not. The accident did not happen "on, in, or about a building which exceeds 30 feet in height." Its former height had nothing to do with the accident. So far as height affected the gravity of the accident it was only a 29-feet building. Whenever the building has been demolished to within the limit of 30 feet, the employment ceases to be within this Act. But you and I have yet to learn how to measure. The basement is taken as the lower terminus in the case I have cited, but the general opinion seems to be that street level is the true terminus.

On this subject Sir Wilfrid Lawson is credited with writing these lines:—

> "If you fall thirty feet slap bang on the street,
> You'll get cash if your head be split;
> But if, cutting it fine, you fall just twenty-nine,
> In that case you won't get a bit.
> So the moral is this—if I'm not far amiss—
> If you are a wise working man,
> If you find you've a call to accomplish a fall,
> Then tumble as far as you can."

You will please note that, if the Act is to apply, the building being constructed or repaired must not only exceed 30 feet in height, but scaffolding must be used. This seems to be essential. The words are "by means of a scaffolding." I suppose that in the case of the construction of a building over 30 feet in height scaffolding will always be used, but this may not be necessary in the case of repairs. Take the case of a plumber mending a pipe, or a slater repairing the roof, neither using scaffolding. These men do not seem to be working under the conditions contemplated by the section we are considering.

But the scaffolding seems only to be an essential in "constructing" or "repairing." It does not seem to form a necessary condition when a building is "being demolished." The building "being demolished" must exceed 30 feet in height, but the section does not require for its application the use of scaffolding. I cannot fortify this opinion by any decision, but this seems the natural reading of the section.

But, proceeding to analyse the section still further, we read—that the Act applies only to "employment . . . . on, in, or about any building . . . . on which machinery driven by steam, water, or other mechanical power is being used

for the purpose of the construction, repair, or demolition thereof." What essentials must you have here so that the Act may apply? No scaffolding necessary; no height exceeding thirty feet; only a "building" and mechanical power used for the purposes mentioned. Now this is important. Whenever mechanical power is a factor in the carrying on of the operations, whether these be constructing, repairing, or demolishing, height and scaffolding are quite immaterial, and the probable *rationale* is that where mechanical appliances are used the workmen engaged are exposed to considerable risks, and require special protection. It seems unreasonable that a workman injured at a building less than 30 feet high, where machinery is used, should be entitled to compensation unless he is injured in connection with the machinery. On this point I refer you to the case of Mellon *v.* Tomkinson & Co., decided on 14th January, 1899.* A workman was engaged in building the wall of a house in Vauxhall Road, London. The wall was not then 30 feet in height. The claimant was on a scaffold just above the basement. Beams were being laid for the purpose of making a flooring. There was a pole run up about 20 feet, and guy ropes from the pole, and fastened to the top of the pole there was an iron wheel with a groove in it. An iron chain went over the top of the wheel. The guy ropes steadied the pole, and the pole also ran into the ground. One end of the chain was to hook the crane on, and the other end to pull the beam in. Six or seven men were at the beam and chain together—two to guide the beam, the rest at the chain. There was a brake on the wheel which stopped the beam from running back. One of the workmen was injured. It was admitted by the employers that a machine was being used *driven by mechanical power*, but they contended that, as the building was not 30 feet in height, the section did not apply, and they were not liable. The Court, affirming the judgment of the County Court Judge, held that, as the building was one in which machinery driven by mechanical power was being used, it was not necessary, in order to bring the case within the Act, that it should also be thirty feet in height.

But the section with which we have been dealing introduces a limitation by the words "on, in, or about any building," and therefore the important question naturally arises on the occur-

* 15 Times Law Reports, page 142.

rence of an accident—Was the employment of the workman "on, in, or about" the building? You can at once see how these words narrow the scope of the Act; and while one case may be held to be covered by the section, another very like it may be excluded. For example, a man while engaged preparing building material in his master's yard may be injured, or he may be injured while conveying the material to a building in course of erection. In neither of these cases could he recover compensation under this section. He was clearly not "on, in, or about" the building. But, by way of contrast, take the case of a man employed as a carter to a firm of builders and contractors.* At the time the accident happened he was receiving a load of timber in the street close to his employers' premises. It was part of his duty to receive the timber and build it on the cart. He was standing on the timber which he had taken on to the cart, when a piece of timber tilted and threw him on to the road, causing his death. His employers contended that deceased's employment was not "on, in, or about a factory" at the time of the accident, as the cart was outside the factory. It was held, affirming the County Court judgment, that deceased's widow was entitled to compensation. It was observed from the bench that the Legislature obviously thought that the word "on" would not include all that they intended to include, neither was the word "in" sufficient, they therefore added the word "about," which was clearly an enlarging word, and covered the case of the carter's employment.

But to entitle the workman to compensation the accident must happen "out of and in the course of the employment." If the cause of the accident is external to the employment, the injured man cannot recover from his employer under this Act. Suppose a chimney stalk adjacent to a factory falls and injures those working in the factory. You could not describe this occurrence as arising "out of" the employment in which those injured were engaged.

The case of Lowe *v.* Pearson† illustrates circumstances under which an accident was held not to arise "out of and in the course of the employment." A lad of 14 was employed in a pottery, his duty being to make clay into a ball, put the ball into a mould, and hand the mould to a woman at work

* Powell *v.* Brown and Another.

† 15 Times Law Reports, page 124.

at a machine. The lad was expressly instructed not to interfere in any way with the machine. In the woman's absence, he attempted to clean the machine, and in doing so his hand was injured. It was held, reversing the decision of the County Court Judge, that the accident did not arise in the course of the lad's employment, and that his employer was not liable. The judges based their decision on the ground that the lad was only employed to make the clay balls, and that he had nothing whatever to do with the machine, and that in interfering with the machine he was going beyond the course of his employment.

I cannot stay to suggest further illustrations in which the Act would or would not apply, but each case, so far as this clause is concerned, must be considered on its own merits.

We may now notice a defence which is available to the employer, but one which will very seldom be effective. Sub-section (*c*) of Section 1 provides, "If it is proved that the injury to a workman is attributable to the serious and wilful misconduct of that workman, any compensation claimed in respect of that injury shall be disallowed." This sub-section excludes the defence of contributory negligence, which has hitherto been so common. In various cases under the new Act the pursuer has been met with the defence that he has been guilty of "serious and wilful misconduct;" but the defence has so seldom been upheld that we may assume it will prove of very slight assistance to employers. The employer must *prove* the "serious and wilful misconduct." Inadvertence, carelessness, or negligence will not be held to amount to misconduct. The misconduct must be serious and wilful, and this means a great deal—misconduct that cannot be overlooked. Let me, in a few sentences, suggest cases in which the defence would and would not avail. For a workman to be drunk while at his work would probably give the employer a sound defence. It undoubtedly would if the accident were directly traceable to his condition at the moment of its occurrence. Again, there is a statutory rule prescribed by the Coal Mines Regulation Act, 1887, to the effect that "No lamps or light other than a locked safety lamp shall be used." It is thought that the breach of that rule would in itself constitute "serious misconduct." An open lamp in a fiery mine involves the risk of an explosion at any moment. Now, for the sake of comparison, consider another rule in the same Act—"A person shall not have in his possession any lucifer match or apparatus of any kind for striking a light," &c. Most workmen carry matches, but

miners subject to the rule I have quoted ought not to do so when at work in the pit. The possession of matches presents a temptation to strike one at any moment, and the above rule is a precaution to minimise risk; but so long as the matches remain in the man's pocket, in ordinary circumstances their mere possession does not increase the danger, and probably a breach of this rule, although blameworthy, would not be characterised as "serious and wilful misconduct." Take a case decided by the First Division of the Court of Session on 24th February, 1899. The pursuer was employed in the defenders' fire-clay mines. In the usual course of his employment he drilled a shot hole, and, having charged the hole with blasting powder in the usual way, after an interval of six minutes from the time of setting light to the charge he left his place of shelter and went forward to the shot hole. An explosion occurred, and, in consequence, the pursuer was injured severely, and lost the sight of both eyes. The defenders stated that, according to one of the special rules of the mine, if a shot has been lighted and does not explode, no person shall enter the place where it was lighted until thirty minutes shall have elapsed. They accordingly pleaded that the pursuer had been guilty of serious and wilful misconduct under the Act. The Sheriff-Substitute found that the pursuer had met with his injuries by an accident arising out of and in course of his employment, and that the accident was not attributable to such serious and wilful misconduct as was contemplated by the Act, and to this judgment the Court of Session adhered. Therefore, I would say to you—Don't plead this defence unless the misconduct is very glaring, and is the direct cause of the accident. Of course, even were the defence of serious and wilful misconduct sustained, the employers would only be exempt from liability to the persons guilty of the misconduct. Others might have been injured in the same accident, and such would be entitled to compensation.

Now, on whom does the 1897 Act fix liability? On "the undertakers," as defined in Section 7, Sub-section 2. Narrowing down the definition to the building trade, an "undertaker," in the case of an engineering work, means the persons undertaking the construction, alteration, or repair; and in the case of a building means the persons undertaking the construction, repair, or demolition. I should like to try and make it plain to you that it is not necessarily a workman's *employer* who may be liable to pay compensation. The person liable in every case is the "undertaker"

of the work, and he may not be the workman's employer. For example, a building is in course of erection. The masons require scaffolding, and the carpenter's workman, while erecting the scaffolding, is injured. His claim will not be against the master carpenter, although he is really the man's employer, but against the master mason, because the master mason is the "undertaker" of the job. And from this you will see that when a builder contracts, as so many do, to erect and finish a building according to specification, and according to architect's plans, he becomes the "undertaker" within the scope of this Act, and is, therefore, primarily responsible to every workman on the job, although he may have no control over him, and although he did not employ him. As you know, building contractors let out the different parts of the work, such as wright and joiner work, plumber work, gas fitting, electric lighting, drainage, &c., to sub-contractors, none of these sub-contractors being "undertakers" within the meaning of the Act, and all of them having employees who, if injured under circumstances entitling them to compensation under the Act, may set their masters aside and claim direct from the chief contractor or "undertaker."

But, by way of contrast, take the case of a proprietor not contracting with a single individual for the erection and completion of a building, but engaging several tradesmen to do the work, each independent of the others. He contracts with a mason for the mason work, and with a wright for the joiner work. Now, if a joiner in the course of his employment is injured, to whom is he to look for compensation? Certainly not to the proprietor, because in no sense is he the "undertaker" as defined by the Act. In such circumstances as I have mentioned there will necessarily be several "undertakers" on the one job, and, therefore, the undertaker, who is also the workman's employer, will probably be liable.

Here, you observe, the workman is to get his compensation at first hand from the head contractor—the "undertaker"—a person who is presumably able to pay. But the undertaker is entitled to be indemnified by his sub-contractor, who is the immediate employer of the injured man, or he can sue the workman who caused the injury if he thinks him worth powder and shot, which in most cases he is not likely to be.

And now as to the compensation recoverable. The intention of the Act is not to provide solatium for wounded feelings or pain suffered. It is to provide means of support to an injured work-

man, or, in the case of death, to his dependents, so that in the general case the amount of the compensation payable will be an arithmetical calculation on the basis laid down in the first schedule of the Act. The exactitude therein laid down considerably simplifies the work of the judge or arbiter in computing the amount payable. Where death results from the injury, "If the workman leaves any dependents wholly dependent upon his earnings at the time of his death, a sum equal to his earnings in the employment of the same employer during the three years next preceding the injury, or the sum of £150, whichever of these sums is the larger, but not exceeding in any case £300, provided that the amount of any weekly payments made under this Act shall be deducted from such sum, and if the period of the workman's employment by the said employer has been less than the said three years, then the amount of his earnings during the said three years shall be deemed to be 156 times his average weekly earnings during the period of his actual employment under the said employer." There is no inquiry required here as to what the standard wage is. The question is—"What were the wages actually earned by the deceased?"

Should the workman leave any dependent not "wholly," but only "in part," dependent upon his earnings at the time of his death, such dependents shall be entitled to such sum (not exceeding the rate already explained) as may be agreed upon, or, failing agreement, such sum as the arbiter may consider reasonable and proportionate to the injury which the workman's death causes his dependents. If the deceased workman leaves *no* dependents, the reasonable expenses of his medical attendance and burial, not exceeding ten pounds, are payable by the employer.

So far I have been dealing with compensation payable in the case of a fatal accident. What is payable in the case of accidents which result in permanent or temporary total or partial incapacity? For the first two weeks the injured workman gets nothing, but after the first fortnight he is entitled to a weekly payment during his incapacity of not more than 50 per cent. of his actual weekly earnings during the previous twelve months, if he has been so long employed, but if not, then for any less period during which he has been in the employment of the same employer, such weekly payment not to exceed one pound. "How is the average arrived at?" In cases decided in the Sheriff Court it has been held that where in the course of a year a workman has been off work on

account of a strike or illness, in striking the average the amount earned during the year should be divided by the number of weeks in which he actually worked. In an English case decided in January, 1899, the High Court rejected this method of calculating the average, and held that the words "average weekly earnings" mean the amount earned by the workman in a year divided by 52.

There are other elements which enter into the computation of the weekly payments, but these I do not propose to trouble you with to-night. The employer may also, in certain circumstances, apply for the redemption of these weekly payments by the payment of a lump sum.

I shall now try to explain to you, in a few words, the procedure prescribed by the 1897 Act. Notice of the accident must be given and action must be taken within a specified time. The words of Section 2 are—"Proceedings for the recovery under this Act for compensation for an injury shall not be maintainable unless notice of the accident has been given as soon as practicable after the happening thereof, and before the workman has voluntarily left the employment in which he was injured, and unless the claim for compensation with respect to such accident has been made within six months from the occurrence of the accident causing the injury, or in case of death, within six months from the date of death;" and the section goes on to provide for the case in which the necessary notice has not been given, or the notice given is defective.

Notice having been duly given and a claim made, the first thing to ascertain is if the employer (or undertaker) admits his liability to pay compensation. If he does, the next question is—Do the parties agree as to the amount and duration of the compensation payable? If they do, then no further procedure is necessary. If they do not, and you may safely assume that many cases of disagreement will arise, then, in terms of Sub-section 3 of Section 1, all differences are to be referred to and settled by arbitration, subject to a scale and conditions of compensation set forth in the first schedule annexed to the Act, and also subject to the provisions of the second schedule. No special form of proceedings is provided for, but it is thought the present practice as to arbitrations may be followed, and the award made by the arbitrator may be competently recorded for execution in the Books of Council and Session or Sheriff Court Books, and will be enforceable in exactly the same way as a recorded decree arbitral. If the parties cannot

agree on an arbitrator, the Sheriff will be arbitrator, and the claimant may proceed by petition in the Sheriff Court in common form. The Sheriff's decision on matters of fact is final, but questions of law may be appealed to the Court of Session, whose decision on such questions will be final. When the parties have mutually agreed upon an arbitrator, there does not seem to be any appeal from his judgment either on facts or law. I suppose this is on the ground that the parties have chosen their judge and must abide by his decision.

Now, I do not think I need add very much more to what I have said. I have tried to place before you briefly and clearly the main provisions of the 1897 Act. There are many points and questions to which I might have adverted, but I have endeavoured to select the leading provisions in so far as I thought them likely to interest you and to be applicable to the practice of your profession and trade. I hope I will not be misunderstood in anything I have said, but one cannot say everything he would like to say in a brief paper. We have briefly looked into the PAST; we have at considerable length dealt with the PRESENT; and what shall we say of the FUTURE? The safer and the easier way would be to let to-morrow take care of itself. This much I may say, the Workmen's Compensation Act of 1897 will require amendment and improvement, but this can only be wisely accomplished in a very gradual way, as circumstances demonstrate wherein it is defective. Already difference of opinion prevails as to the construction of various clauses, and one is not at all surprised to find that an Act so far-reaching and revolutionary in its character should have failed to provide for every case that turns up.

I told you in my first sentence that I did not know much about the subject in an experimental sense, but I trust that the brief survey I have tried to submit to you may enable you to grasp more intelligently, and with more interest, the reason of the decisions which you are likely to see reported in the newspapers from day to day.

Note.—It is perhaps right to mention that since the date on which this lecture was delivered many judicial decisions have been given which might modify or confirm the opinions expressed, and the lecture ought to be read in view of the fact that the Act had then been less than nine months in force.

XII.—*The Prospect in Chinese Trade and the Present Opportunity.*

By G. F. Scott Elliot, M.A., B.Sc., F.L.S., F.R.G.S.

[Read before the Society, 29th March, 1899.]

My reasons for reading this paper require, perhaps, a little explanation.

The very slightest study of tea and cotton leads one to the study of China, and then it does not require much reflection to see the extraordinary importance to Great Britain of Chinese trade; yet, in November of last year, when I undertook this work, I had not the slightest conception of the extraordinary crop of papers, articles, and reviews which had to be published between November and to-day. My excuse for this paper is its importance. It is quite impossible to speak the truth without saying unpalatable things; but, if those who may be my readers are induced to study the question for themselves, I think they will be grateful to me in the end.

Even with this harvest of literature, to get satisfactory and solid information is a matter of no ordinary difficulty. Every book is full of the most absurd and trivial details, thus, *e.g.*, "Some fish lines are made entirely of silkworms taken alive between thumb and finger of each hand and stretched about 2 feet long. Each end is then stuck on to the edges of a table, and allowed to remain there until absolutely (8) dry." (Mesny, I., p. 70.) One learns the names of the traveller's servants, down to that of the meanest kitchen scullion, and the weather of each day's journey. Certain hardy insect parasites of mankind flourish more abundantly in books of Chinese travel than anywhere else. Moreover, those who are connected with the great Chinese firms are not particularly anxious to hold out favourable prospects. Missionaries are too much taken up with the other world to care about commerce.

In fact, everyone is so fascinated with the paradoxes of Chinese character and civilisation, *e.g.*, practical Malthusianism in the shape of female infanticide before Malthus was born; bribery and corruption in the whole body of government servants;

bow and arrow exercises near Pekin during the Japanese war; and along with this an astuteness which has proved more than sufficient for British diplomacy, and the most high-flown copy-book stories, such as the child which took off its clothes to attract the mosquitoes from its aged parents. Mr. Bourne (9) mentions that in those places where the fields are irrigated for rice the farmers are in the habit of hatching fish artificially by a process which involves an intelligent idea of the ova and the way in which they should be handled. It is also the case that coal dust is made into a marketable fuel by being mixed with clay (10).

The most lurid light of all is thrown on Chinese life by the bald statement that a book containing 3,000 rules of etiquette is studied by every boy at school (4).

Of the many authorities which I have studied, the following are, in my opinion, the most reliable:—Baron von Richthofen, who is cited by every serious writer on China (1). Mr. Bourne, who was in charge of the Blackburn Commercial Mission, has published his report, which, to my mind, is by far the best account of the whole subject (2). I have also found anything written by H.M. Consuls and Acting Consuls, Hosie (4), Brennan (5), Jamieson (6), and Litton (7) of the most valuable character, and particularly Hosie's "Three Years in Western China." Chisholm (3), Colquhoun's "China in Transformation" (14), Chirol's "Far Eastern Question" (13), are also valuable and up to date. The authorities are given in what follows.

China is a much larger country than we are in the habit of realising. It covers 1,500,000 square miles (15), and whilst the winter at Pekin is more rigorous than our own (so much so that for part of the year it is inaccessible to our fleet), malaria and other tropical products flourish at Hongkong.

The country is, perhaps, best subdivided as follows:—

1. Mountainous Western and Central China, roughly limited by the 110th degree of longitude (2), and producing wheat, maize, opium, and minerals.
2. The great alluvial plain of the Yangtse River, extending a hundred miles on either side of the Yangtse to the sea; with this has to be taken the loess and alluvium of the Hoangho. The density of population here is extraordinary, probably 300 millions (16) live in this area alone. The port is Shanghai, and the products are rice, beans, cotton silk, &c.

3. The coast facing Formosa and the West River, with the port of Hongkong, form the third area, which grows cassia, star-aniseed, tea, oranges, &c. (17).

Students of economic botany will see that in the above list are included plants of every recognised climate, and as a fact it is very difficult to think of any valuable plant which cannot be grown in China. It is sometimes said that there is no export from China of sufficient importance to justify our hopes of the future cotton trade!

The Chinese nation is definitely limited by the cultural possibilities. Where the pastures begin in the north-east there are Mongolian tribes, and in the mountains to the west the Chinese appear to have left the aborigines in possession of the grazing land.

As to the means of penetrating this enormous territory and throwing it open to our commerce, it is perhaps best to begin with the land routes across Thibet and Mongolia to Central Asia. Along the northern boundary there are two important trade routes and a few minor caravan tracks leading across waterless deserts and stupendous mountain ranges. One of these, the Kiachta route, enters Russian Siberia. The journey occupies 40-50 days, and the services of some 16,000 men and 80,000 horses are required (18). The present total value of the trade is estimated at 17,940,241 roubles (19) in 1894, or 31,000,000 marks (20). The other, through Sungpan, has been admirably described by Mr. Litton, who estimates the value of the trade as 1,500,000 taels (21).

In both cases the chief article is tea for Central Asia, and in return comes wool, musk, &c.

Indirectly we can reach China through Thibet by two routes from British India. One of these, *viâ* Leh through Kashmir, was estimated by Captain Trench as amounting to Rs. 6,216,177 in 1896 (22), but in 1897-98 it had greatly fallen off, owing to Russian competition (23). The second, *viâ* Sikkim, is said to amount to 10½ lakhs annually (24). A great want of energy on our part will apparently result in the predominance of Russian influence in Thibet, but this is not of much importance, for it will be almost impossible for the four trade routes here given to become of any importance owing to the Great Siberian Railway.

This railway, connecting European Russia with the Pacific Ocean at Vladivostock and Talienwan in Manchuria, will probably be finished in 1902. As the line lies across the navigable waters

of the great Siberian Rivers, with, as Dr. Krahmer (25) states, 5,000 square miles of good culture soil along its course, and as Captain Younghusband estimates the future population of Manchuria as 40,000,000 in 50 years' time (26), it cannot be denied that the railway is a commercial idea of the rank of the Suez Canal, and will profoundly modify the commerce of the far East. The idea of such a line is oddly enough due to an obscure English engineer, Dull (18), but the Czar, Alexander III., must be credited with a foreseeing practical statesmanship which is entirely lacking in the policy of at least one first-class power.

This line, besides serving Manchuria, now entirely under Russian influences, will certainly take all passenger traffic to North-East China (it is intended to charge 120 roubles for a first-class ticket, and the journey will occupy about 17 days, afterwards 9 days) (27). It will probably carry tea and silk to Europe, and bring into China from Siberia, *e.g.*, timber, wool, European products, &c. Here is a danger to the future of British Columbia, where there are 40 to 100 billions of cubic feet of timber in sight awaiting export to China (28). This Siberian railway, aided by the North-Eastern Railway from Pekin to Newchwang, is a trade route which our ships will have to compete with.

Along the western frontier of China there is a terribly mountainous country, broken up into a series of deep parallel precipitous cañons, in which flow the great rivers Salween, Mekong, Songkoi, Red River and their tributaries, as well as various branches of the Yangtse.

The difficulties of railway enterprise in such a country are best judged by a study of Mrs. Bishop's journey (29), and that of Prince Henry of Orleans (30), not to speak of Holt Hallett, Baber, Colquhoun, Gill, and a host of other writers (31). As things stand at present, there is one route to Thibet in the North (Tachienlu), which Mr. Litton estimates, from Chinese authorities, to have a trade of 2,085,000 taels.

Coming further south we have, *first* (32)—the British Burma Railway, which ends at Myitkyina, close to the Chinese Frontier; *second*, the branch to the Kunlong Ferry, which will apparently not be finished until 1901 or 1902 (33); *third*, various caravan tracks which converge chiefly towards Chiengmai (trade £25,000) (35), and other points in Siam, the Shan States, and Burma; *fourth*, the two railway lines in French territory, one to Langson, already at work, and the other to Laokai, which is building (34). This last is

intended simply and solely to cut off the Hongkong, Macao, and Canton trade, value 3,000,000 taels, into Yunnan by the West River (36), (37). M. Le Roy Beaulieu points out that commercially these railways (36) can scarcely be considered very promising. The whole question is a political and military one, and not commercial. France has practically no trade in these regions, but Great Britain might find the access to the Yangtse Valley from India, by a road sufficiently good for wheeled vehicles from Kunlong Ferry to Talifu, of the greatest commercial value, as well as a political necessity which it is absurdly imprudent to neglect.

Deferring consideration of this question until the whole Russo-French policy is considered, the next point is the manner in which the vast empire of China is intersected by natural water-ways. The Yangtse is navigable by steamers certainly to Ichang, and apparently a steam launch has reached the city of Chungking, which is said to have a population as large as Glasgow. Beyond this point it is still a commercial river, both to Chengtu, no less than 2,000 miles from the sea, and Pingshan Suifu, a little above Chungking. This is, of course, in itself magnificent for commerce, but, besides this, a tributary on the north is navigable for at least 500 miles from Hankow to Hanchung. On the south bank of the Yangtse the Tungting Lake has two navigable rivers, the Yuankiang and Siang, which will open the closed province, Hunan, to British goods. Further east, the Po-yang Lake and its rivers, and the various branches of the Yangtse itself, are all more or less navigable, and there are also canals, such as the Shasi Canals and the Grand Canal, which may become of the greatest possible service. A very useful map, showing the whole of the navigable water-ways in China, is given by Mr. Chisholm (12) in the *Geographical Journal* for November, 1898. I had intended to produce a map for the same purpose, but this is quite unnecessary when any member of this Society can obtain it for 2s. The navigation of the Hoangho is of less importance, but that of the West River is an important factor in the development of Southern China. Here I venture to point out that Mr. Chisholm represents the navigation as stopping at Lungchow, whereas other authorities state that Pose (40, 41), on the borders of Yunnan, can be reached by boat. A very important point is that goods can actually go almost entirely by water *via* the West River, its tributary the Kwikiang, then by a canal to the Siang River, and down this to the Yangtse Valley (31, 39, 12, 4).

This leads me to what I believe to be a necessity for British trade. A railway should be at once built, either along this route from the limit of steam navigation on the West River to the limit of steam navigation on the Siang, or directly from Kaulun to Canton, and thence to Hankow. Otherwise we are liable at any moment to have our entrance to the Yangtse Valley closed at an inconvenient season.

As to the railway schemes at present conceded, the line from Newchwang to Pekin and thence to Hankow on the one side, and to Shansi on the other, will certainly be of the greatest possible use to the Russian tea trade, and will also enable Russia at any moment to occupy the Yangtse Valley in force. The proposed German railway (it is expressly stated that the Shantung line is to be owned, built, and worked by Germans) will undoubtedly be of use to German trade (42). The other lines are of but small importance to British trade; in fact, the whole system of railways appears to have been directed with a view to the exclusion of British trade.

If this were a small matter it might be borne with patience, but Chinese trade is not a *quantite negligeable* at present, and it may become anything from £100,000,000 to £400,000,000. At the time of the first Chinese war the foreign trade was £500,000. In 1896 it was worth £57,117,473 (43), of which Great Britain obtained 71 per cent. In 1897 it fell off nearly a million pounds sterling (44), and it appears to have been even less in 1898 (45). Our share in April, 1898 (Imports into China from the British Empire), was estimated at £27,488,000 (46), which even the most incurable official optimist must admit is not a sum the loss of which is to be taken with equanimity.

The possibilities are best judged from the cases of Hongkong and Shanghai. In 1842 a square mile of marsh and mud was set apart as the British concession at Shanghai. The population now increases 20 per cent. annually, and the trade has doubled itself in the 10 years (Bourne) from 1885 to 1895. The growth of Hongkong from a malarial island inhabited by pirates to the present centre of commerce for the whole Pacific, with a trade of £23,500,000, lies entirely within the reign of Her Majesty the Queen (47).

One difficulty is sometimes given as likely to hinder future development, namely, the absence of any great export staple, but those who speak of this appear to forget the extraordinary value

of Chinese labour. The tea porter carries 244 lbs. of tea a distance of 10 to 20 miles at a wage of 6d. a day (Bourne). Women's (48) wages at the cotton mills are 1½d. to 4½d. a day, and the day is one of 12 hours. All authorities agree as to the mechanical dexterity of the Chinese and their ability to learn. As regards efficiency, the amount performed for the wage given, there can be small doubt that Chinese labour is more efficient and cheaper than any other labour.

Hence, although at present but few concerns have been started, *e.g.*, albumen factories, steam silk spinning, cotton mills, feather-cleaning machines, and so on, the favourable results already attained show nothing to set against the possibilities of Chinese hands working under European brains. I do not, however, believe that we shall see the solution of the cook and housemaid problem by the introduction of Chinese helps.

Of the more particular trade questions in China, cotton is by far the most important to us.

The clothing of 400 millions of Chinamen and women can never be a small matter commercially.

At present things are in a state of transition: the cotton is grown in China itself, in British India, or in the United States of America. The yarn for cloth is brought to China from British India, England, or Japan, or it is produced in China. Cotton piece goods come from England, India, Belgium, the United States, Germany, America, Switzerland, Italy, and Japan, and they are also made in China (49). The possible systems to be derived from this extraordinary series of competitors are almost infinite in number. Indian yarn is at present a very large import, but this year it shows a very serious decline, as do piece goods of Indian manufacture (50). There can be no doubt that in the end Chinese cotton, grown, spun, and made into cloth on the spot, will clothe a large proportion of the Chinese. At Shanghai the number of spindles has increased from 30,000 in 1894 to 290,000 in 1897 (51). The cost of production is seven-eighths of a penny per yard. A strong white native cloth (Bourne) is actually sold retail at 1½d. to 2¼d. per yard (52). Shasi, in fact, exported 20,000,000 lbs. of cloth in 1897. At one port the Chinese native cloth increased ninefold in one year (51). Our own piece goods find their most dangerous rival in the Japanese; at present we have almost a monopoly of the higher counts, but these are not likely to remain in our hands for

ever, especially if a line of steamers runs from Mexico connecting Japan with the cotton States by the Tehuantepec Railway (53). The Yangtse cotton is not capable of finer yarns than 20's.

At present Belgian thread is a rival to Paisley (54), and, considering the manner in which the Japanese have reduced their import, it is very necessary to be on our guard. It is, at any rate, certainly not the time to neglect establishing firmly any trade while we can do so. Our consuls annually complain that the manufacturers will not produce cloths of a width of 14 to 20 inches (55). The Government also does not insist on our clear treaty rights and the respect of transit passes (56).

One point is absolutely certain. France and Russia, established in the Yangtse plain, would find it very easy to exclude British piece goods and yarn altogether.

Silk forms one of the exports of most parts of China from Manchuria to Szechuan. Of the world's supply of raw silk, given as 14,685,000 kilos in 1895, China gives 5,500,000 kilos, *i.e.*, more than Italy, France, and the Levant put together (57). As pointed out by Professor Nocentini (58), the danger is that the Italian industry will prove unremunerative and die out. Even now the introduction of Pasteur's methods and the steam filature have made a traceable difference in the returns of export, and Russia in Manchuria has a great opportunity of developing the wild silk industry (due to Antheraea Perryi from leaves of *Quercus serrata*) (59, 60, 61).

The next article, tea, is one in which we are distinctly interested, for we have some £35,000,000 of capital invested in the Indian and Ceylon industry, and at present the plantations are thriving and remarkably well off for a British industry. We all know that the British Indian tea fight has ended in a victory for the British grown tea (62). China produced 35 per cent. of the world's tea in 1896, while in 1871 she produced 86 per cent. But few realise the burdens under which Chinese tea still maintains an export of 55,000,000 lbs. to the United States and a larger export to Russia (63). There is, first, the export duty of 30-35 per cent. *ad valorem*, often exacted in a pernicious manner. There is also shameless adulteration, and, finally, the entire process is performed by hand; some kinds are picked over 13 times by Chinese women (64). If there is any special flavour in Chinese tea, it is probably due to this cause (celestial moisture), but, whatever be the future, we cannot afford to allow a hostile

tea policy in China. At present the export to Russia is almost a romance of modern commerce. Some is carried on pony and camel back through Persia to Central Asia; quantities are taken by the tea porters and yaks into Thibet. In return comes back wool, musk, and yaks' tails, which are used for ceremonial purposes throughout the East. Some is taken to Batoum, on the Black Sea. A large amount, relatively, comes to London, and is thence transported to the mouths of the great Siberian rivers by Captain Wiggins' steamers. Unfortunately all these routes will be replaced by the Siberian Railway (65).

Opium used to be, and still remains, a useful monopoly of the Indian Government, but the demand in China is falling away (65). The native drug, being much cheaper and a paying crop (39 dollars per acre) (66), especially as it does not interfere with rice growing, is gradually driving out the Indian. It is stated that at Pakhoi the native opium pays only 8 per cent. *ad valorem*, and the foreign drug pays 21 per cent. Probably there will be a certain steady demand for Indian opium from the richer Chinese, although, by the use of Barbadoes aloes, the bitter taste of the native drug can be removed (67).

In the petroleum trade America and Russia are in sharp competition. At present the United States of America send about 48·6 per cent. and Russia 37 per cent. (68), the balance being from Dutch Sumatra.

Both as regards imports and exports there is an extraordinary variety of sometimes the most extraordinary articles sent into China (69). No less than 87,318 pairs of dried lizards were sent into China in one year from Pakhoi, then there are birds' nests, cuttle-fish, sharks' fins, fish maws, seaweed, and the curious caterpillar fungus, *Cordyceps Sinensis*.

The first of those points in which Glasgow is specially interested is the development and maintenance of steam navigation in China. Steamers and steam tugs and launches drawing barges will be required to carry the £100,000,000 of the future Chinese trade. There is no doubt that stern wheelers and launches drawing as little water as possible could be manufactured quite as well here as in Japan and Bremen, where they are at this moment being produced for the Chinese trade (70). Nor is it reasonable to suppose that the Chinese will come to Glasgow for orders. The manufacturers must go to them, and that immediately, or this vast market will be lost. The manner in which the officials look

after the navigation can be judged from the following facts. Owing to a landslip, a large amount of rock created a new rapid on the Yangtse River. At this spot 100 wrecks occurred, and 1,000 people lost their lives; a town even sprang into existence with 10,000 inhabitants, for every single junk was unloaded and dragged up past the obstruction. Yet a few charges of dynamite would have disposed of it, but this was against the interests of the officials (71, 72, 73). Again, a boat containing an official was wrecked on the river, and he despatched a deputy with a dozen stone-masons armed with chisels to remove it (74).

In China there are enormous marshes awaiting reclamation; irrigation canals which must be built to save 10,000,000 people dying of famine as in 1878; rivers to be properly embanked; and civil engineering of every sort and kind is required. Whether, *e.g.*, a fixed engine could be employed at the rapids, instead of the present armies of coolies, is an interesting question.

A more remarkable case is that of the beautiful and fertile Chengtu plain, far up in the north-west of China. This depends for its fertility on a wonderful series of irrigating channels, natural and artificial, which are supplied mainly by one river (75). Every year the entire population is summoned to the town of Kan Hsien, and the river is, with great ceremonies, diverted from its course by bundles of stones in bamboo baskets. There is no particular reason why the regular use of dredgers would not prevent this waste of labour, which has occurred annually for 2,000 years.

Again, as regards mining and pumping machinery, there is a great field for British enterprise. The salt wells of Szechuan date from 1,700 years ago, and are sunk to a depth varying between 2,000 and 5,000 feet. To make one of these wells, a wrought-iron rod, 14 feet long, with a sharp chisel edge, is rammed deeper and deeper into the earth, joints being added on as required. The rod is worked up and down by a lever, which is raised by a number of coolies jumping on one end and lowered when they jump off, and it is not surprising that it takes some 30 to 40 years to sink a well (76). Boring machinery would very easily replace this prehistoric method. The brine is pumped up sometimes from a depth of 6,000 to 7,000 feet by a system which is simply that of a bucket and windlass. The bucket is a hollow bamboo, 60 to 100 feet long, and 3 inches in diameter, with a valve at the bottom, and holding some 256 lbs. brine. The rope, made of bamboo, is passed

over a pulley, 60 to 70 feet high, and is eventually wound on a drum by the exertions of three or four water buffaloes, which are made to gallop round and round for 20 minutes at a time. These animals are not agile by nature, and only last from one to five years at the work (77). Nor would pumping machinery for such wells meet with merely a limited demand, for it is by such clumsy means as this that inland China gets its salt.

As regards mining, Baron von Richthofen is of opinion that China has a larger supply of coal than exists anywhere else in the world. As to the average quality, no person is capable of giving a satisfactory opinion. At present it is in most parts of China picked out in baskets by women and children.

Gold, to the value of £733,000, was exported from China in 1895 (78). Silver is recorded, and all the following ores, of which there are no trustworthy data as yet:—lead, copper, tin, zinc, spelter, cinnabar, marble, kaolin, as well as both coal, anthracite, and iron ores (79). Most of these deposits occur in Yunnan and Kueichow (80). But it would be injudicious in the extreme to assume that these ores exist in paying amounts.

According to the best observers, there is no better site for industrial enterprise anywhere in the world than the Yangtse Valley, with its navigable water-ways, its mines of coal and iron, and its unlimited supply of cheap and intelligent labourers (2). (Bourne).

Unless we occupy this district commercially, Germany and Japan will do so. Japan has made a beginning already.

There are many other articles of Chinese trade which, under enlightened management, are capable of great development. Thus, indigo, sugar, jute, tobacco, China grass, camphor, and an infinite number of drugs, spices, and sundries, await development.

Before passing on to the few definite practical steps which I venture to recommend, let me sum up the foregoing remarks. In every one of the leading articles of British Indian trade, China is capable of becoming a serious trade rival. To all European industries, textiles, mining and machinery, and metal work, China is at present a valuable market, but may eventually become a dangerous competitor.

Truly, it would be wiser to use every energy to seal up China to the foreigner, and allow the officials to work their will with the "stupid" people. This is impossible, for every day sees

Russia and Germany moving into China, and it would be incurable folly for us to stand aside.

What, then, is to be done? The real difficulty of finding a policy lies in the vested interests in China.

Now, as Mr. Bourne points out, and as is quite obviously true, the interests of the British manufacturer, clerk, and factory hand are by no means identical with those of the great merchant houses of China. It is to the advantage of these latter to risk nothing, to keep on good terms with the Chinese officials, and even to allow charges of a shilling or more per piece to be levied on goods in the interior, whether this is contrary to our rights or not. The merchant wishes to retain his monopoly and run no risk. Here Messrs. Brennan, Bourne (81, 82), and Professor Douglas (83) point out the clear obvious remedy.

It is necessary for manufacturers to push their trade with China personally, and by commercial travellers who will travel everywhere throughout the empire. This is the principle adopted by Messrs. Coats (84). It is one of the most horrible facts in history that, whilst the Lyons Chamber of Commerce, Blackburn, Japan, Switzerland, Belgium, and Germany have sent commercial missions to China, Scotland, and especially Glasgow, has done absolutely nothing. Messrs. Coats' firm alone has shown characteristic Scotch commercial energy.

The greatest difficulty to the expansion of trade comes from the extraordinary government of China. There are two sharply contrasted classes—*first*, the working class, coolies, labourers, tradesmen, &c.; and, *secondly*, the officials, *litterati*, and their hangers on.

The latter are an aristocracy happily unknown elsewhere. They are maintained by exactions, commissions, squeezes, &c., which correspond to an arbitrary tax imposed on every enterprise and on all labour. They are nominally recruited by competitive examination, but once they have attained their degree, their future progress depends on family influence, capacity to bribe, or being useful to some one in power. Their ignorance is appalling. The Foreign Minister of China was not sure if Peru and Beluchistan were the same place or not.

In some respects, in their policy of preserving China from the foreigner, in their scorn of honest labour, and in the extraordinary value they attach to mere words and style and sentiment (and in this respect no one can deny the extraordinary

ability of Chinese statesmen, who are far too astute for the British diplomatist), as also in the total absence of practical knowledge, they afflict one's mind with a vague sense of all this being quite familiar. It is difficult to trace this weird and alarming feeling down to its source, but in the Little Englandism of Mr. Labouchere, in the peace ideals of the Czar, and even in the ways of our Government offices, there are germs which, if not checked by British commonsense, are capable of developing a British China.

In one respect we are happily different. What is, honestly speaking, bribery and corruption prevails from the highest statesman to the foreigner's body servant.

Against this organised mass of official opposition there is but one argument, viz., physical force, obvious and imminent. Hence the Russian, French, and German success. No other nation but ourselves would have permitted the establishment of likin, or those other taxes under all sorts of names, on silk in the cocoon, on tea whilst unplucked, or on the tradesman who has bought British goods after he has paid transit duties. The cost of collecting likin is said to be 70 per cent. of the amount realised (85). On this point almost every Foreign Office report, the Imperial Maritime Customs, and indeed every impartial writer, are entirely agreed. There are, *e.g.*, 36 likin tax stations on the 130 miles of the Grand Canal.

No treaty, no understanding with, or definite promises of, the Chinese Government, are of the slightest use. Even if made with honest intentions, the provincial governors are independent and can do as they choose.

On the other hand, there is not the least difficulty in reading the Franco-Russian policy. Russia is established in Manchuria, now entirely under her influence (87). With the Siberian Railway, and with the North Eastern Railway to Newchwang, which is, oddly enough, to be built by British money and authorised by British guarantees, she can at any moment throw an overwhelming force into Pekin. Our navy can do nothing to prevent it, at any rate in the winter. Moreover, if the Belgian Pekin-Hankow Railway is really built, there would be no difficulty in occupying our supposed sphere, the Yangtse Valley. The Yangtse Valley is described as the British sphere in Mr. Little's paper. The fact is, either this is our sphere or we have no interest in China. France is pushing up to Thibet, and obviously intends to join with that country and

cut off any access from Burmah or India to the Yangtse. Can the matter be more clearly stated than it is by M. Fleury-Ravarin—"When the hour will sound for the disintegration of China, France will be there with 25,000,000 of Annam soldiers" (86).

There are people in this country who speak of France as a friendly nation, but surely we have had enough of Fashoda questions, and what has happened in Siam, Sierra Leone, Gambia, the Niger, Madagascar, and Muscat, can only be explained on military and not on commercial grounds. This even peeps out in, *e.g.*, Prince Henry of Orleans' paper in the *Geographical Journal* (30). At any rate, with France in Yunnan and intriguing with Thibet, and with Russia in Manchuria, we should be utterly helpless in a military sense in the Yangtse Valley (89). Even if no force is used, the idea apparently of Madame Novikoff, that Russia and France should not annex, but utilise China, sit behind her brain, guide her hand, and direct her forces, moral and material, contains in it something rather terrible to Great Britain (90). The spirit of French officials to British trade is not friendly even at Paris, and the possibilities of danger to our present China trade, not to speak of tea, opium, indigo, and the labour supply of the entire Pacific Ocean, are serious in the extreme.

There are three obvious practical remedies to this danger, so obvious and so necessary that it is astonishing no one has, to my knowledge, recommended them. *First*, to encourage Germany to occupy Shantung and Shansi, so cutting off Russia from the Yangtse: *second*, to occupy ourselves all China north of a line from the Kunlong Ferry in Burmah to Talifu and the Yangtse Valley; *third*, to build a railway without delay, not only from Kaulun (opposite Hongkong) to Canton, but also from Canton over the watershed into the Yangtse Valley.

That it is possible for Germany, Japan, the United States, and ourselves to preserve an open door in China appears to be Lord Charles Beresford's view. But, commercially, all these nations have directly opposite commercial interests. Japan is a rival in textiles, shipbuilding, and tea; Germany in piece goods, machinery, and sundries of all kinds; and the United States competes in all sorts of textiles, in machinery and raw cotton, and must be opposed to us in commercial matters.

Is it possible for four such allies to pursue such a firm and fearless continuous policy as alone will avail against two determined rivals?

We are at Wei-hai-wei in an entirely isolated position. It does not appear to be generally known that navigation is possible from Kiaouchow on the south to the Gulf of Pechili on the north of Wei-hai-wei by a canal and two small rivers (91).

Moreover, at present, Germany is occupying her sphere of interest and building railways (92). This hinterland is understood pretty liberally by Von Richthofen. France is shown on German maps as extending from Thibet to the sea, and no protest or action is obvious on our part (93).

Why have we not occupied our sphere of interest? Why have our gunboats not returned to the Yangtse Kiang, where they established our present predominant position in the trade of China? It is difficult to perceive a British policy, and the issue of a Blue Book of 360 pages, carefully recording matters of no importance, is scarcely satisfactory. Even Denmark is sending a cruiser to protect her commerce.

BIBLIOGRAPHY.

The following does not pretend to be a complete bibliography of China, but is an attempt to give the most recent papers. So much has developed in the last three years that older works are out of date. The many quotations from the reports of consuls, the *Board of Trade Journal*, and the *Times*, are explained by the greater authority of these as compared with the opinions of merchants and travellers :—

1. Richthofen, China. "Ergebnisse," &c. Letters to the Shanghai Chamber of Commerce. Deutsche Kolonial Zeitung, Aug. 11, 1898.
2. F. S. A. Bourne. Trade of Central and Southern China. Foreign Office Diplomatic and Consular Reports, Miscellaneous Series, No. 458.
3. Chisholm. Geographical Journal, Nov., 1898, p. 400 (Stanford), price 2s.
4. Hosie. Three Years in Western China. London, 1897.
5. Brennan. State of Trade at Treaty Ports of China, Annual Series. Diplomatic and Consular Reports, Foreign Office, No. 1909 (also Nos. 1606, 1986).
6. Jamieson. Foreign Office Report, Annual Series 1740, Shanghai and Miscellaneous Series, 415.
7. G. J. Litton. Foreign Office Reports, Miscellaneous Series, Nos. 475 and 457.
8. Mesny. Chinese Miscellany, Shanghai, p. 70.
9. Hosie, l.c. p. 17.
10. Hosie, l.c. p. 29.

11. Martin. Cycle of Cathay, Edinburgh, 1896, p. 323.
12. Chisholm, l.c. p. 400.
13. Chirol. Far Eastern Question. London, 1896.
14. Colquhoun. China in Transformation. London, 1898.
15. Bullock. Journal Manchester Geographical Society, vol. 14. 1898.
16. See (88). Compare also Bourne and Little.
17. Supan, Petermann's Mittheilungen, Band 44, 1898, Part IV., p. 81.
18. Dr. Lampe, Aus Allen Welttheilen, vol. 28, 1897, pp. 401, 443, 473.
19. Abstract of German Consular Report in Board of Trade Journal, February, 1896, p. 210.
20. Ehlers. Im Osten Asien. Berlin, 1896.
21. Litton. Foreign Office Report, Miscellaneous Series, No. 457.
22. Board of Trade Journal, November, 1896, p. 550.
23. Captain Trench. *Times*, January 19, 1899.
24. Board of Trade Journal, September, 1896, p, 298.
25. Krahmer, Sibirien. Leipzig, 1897.
26. Younghusband. Nineteenth Century, March, 1898.
27. National Geographic Magazine, VIII., 1897, p. 120.
28. Journal Society of Arts, February 17th, 1899.
29. Mrs. Bishop. Geographical Journal, July, 1897, p. 19.
30. Prince Henry of Orleans. Geographical Journal, December, 1896, p. 566 (note—pp. 570, 571).
31. There is a good discussion of this question in Colquhoun (14). See also (33), (34), (36), (38).
32. Litton. Miscellaneous Series, No. 475.
33. Nisbet. Journal Society of Arts, January 27, 1899, p. 184.
34. An excellent map and discussion in Board of Trade Journal, March, 1899, p. 267, also in same Journal, April, 1898. The authorities are H.M. Consuls at Bangkok and Chiengmai, the Revue Coloniale, and articles in the Economiste Français, by M. Le Roy Beaulieu.
35. Beckett. Foreign Office Annual Series, Chiengmai, No. 2192, 1897, and Hosie, l.c. p. 204.
36. Wilkinson. Foreign Office Annual Series, Pakhoi, No. 2079, for 1897.
37. Morse. Commissioner of Customs, Lungchow, Trade Report for 1896.
38. Le Roy Beaulieu, v. (34), pp. 267 and 274.
39. Colquhoun (14), l.c. Map, p. 137.
40. Colquhoun (14), l.c.
41. Hosie, l.c. p. 204.
42. Compare *Times*, February 13, 1899, also (93), also Map (Phillips), *Daily Mail* Commercial Map.
43. Younghusband. Contemporary Review, October, 1898, p. 462.
44. Hopkins. Annual Series, No. 2145 (1897), and Board of Trade Journal, January, 1899, p. 55.
45. *Times*, February 8, 1899.
46. Board of Trade Journal, April, 1898, p. 395.
47. Do., do., p. 396.
48. Jamieson. Foreign Office Annual Series, No. 1605 (1894), p. 20 and (51).
49. Board of Trade Journal, August, 1896, and O'Beirne, Foreign Office Miscellaneous Series, No. 455.

50. Board of Trade Journal, May, 1898, and February, 1899 (Tables of Export).
51. Mansfield. Foreign Office Annual Series, No. 2156, Shanghai, for 1897, also Bourne (2).
52. Bourne (2), p. 25, and Annual Series, Hankow, No. 1718, and Annual Series, Shashi, No. 2086.
53. Board of Trade Journal, January, 1896, p. 37.
54. Board of Trade Journal, March, 1896, p. 283.
55. Holland. Foreign Office Annual Series, Ichang, No. 1944, 1897, p. 3, also Bourne (2) and Board of Trade Journal, April, 1898.
56. Scarcely any Foreign Office Reports fail to record this.
57. Lyons. Syndicate of Silk Merchants in Board of Trade Journal, April, 1896 (Tables, p. 461).
58. Nocentini, *Gli Interessi Italiani nella Cina*, Rivista Geographica Italiana, vol. 3, 1896, p. 545.
59. Colclough. *Times*, January 13, 1899.
60. Hosie. Foreign Office Annual Series, No. 1780.
61. Mansfield. Foreign Office Annual Series, No. 2156, Shanghai, p. 15.
62. Supan, Petermann's Mittheilungen, Band 44, 1898, Part XI., No. 804, p. 189.
63. Calcutta. "Capital" *v.* Board of Trade Journal, May, 1896.
64. Frazer. Foreign Office Annual Series, Wenchow, No. 1579, p. 5.
65. Imperial Maritime Customs, 1897 (P. S. King & Co.). Board of Trade Journal, May, 1898, p. 524.
66. Fox. Foreign Office Annual Series, Wenchow, No. 1693, also Tratman, Chungking, No. 1738.
67. Hausser. Annual Series, Swatow, No. 1737, for 1895.
68. New York Engineering and Mining Journal *v.* Board of Trade Journal, August, 1898, p. 217.
69. Wilkinson. Annual Series. Pakhoi, No. 2079, p. 8.
70. Weser Zeitung. Board of Trade Journal. November, 1898.
71. Holland. Annual Series, Ichang, No. 1944, p. 7, for 1896.
72. Geographical Journal, August, 1897, p. 191.
73. Tratman. Annual Series, Chungking, No. 1943, for 1896.
74. Chungking, Annual Series, No. 1598, for 1894.
75. Litton. Miscellaneous Series, No. 457, p. 32.
76. Hosie, l.c. p. 78.
77. United States Consul-General at Shanghai *v.* Journal, Society of Arts. March 11, 1898.
78. Director, United States Mint, Board of Trade Journal, May, 1897, p. 534.
79. A Travers le Monde, 1897, vol 3.
80. Board of Trade Journal, November, 1897, p. 551.
81. Bourne, l.c.
82. Brennan. Annual Series, Canton, No. 1606 (1894).
83. Professor Douglas. See Report, *Times*, January 17, 1899.
84. I cannot state the actual results of this spirited policy.
85. The following are specially clear on this point:—Hosie, Wenchow, No. 2168; Allen, Foochow, No. 1719; Carles, Foochow, No. 2072;

Brennan, Canton, Nos. 2175 and 1986. Also State of Trade, Brennan, No. 1909.

86. M. Fleury-Ravarin, Député du Rhone. Questions Diplomatiques et Coloniales, vol. 1, 1897, p. 137. Also Moreing, Nineteenth Century, September, 1898, and Bourne, l.c.
87. Younghusband. Contemporary Review, October, 1898, p. 463.
88. Little. Journal, Society of Arts, December, 16, 1898.
89. Blackwood's Magazine, February, 1898, p. 307.
90. See Mr. Colclough's Report to British Chamber of Commerce in Paris.
91. Dr. Hirth. Deutsche Kolonial Zeitung, December 25, 1897, p. 539.
92. Geographical Journal, December, 1898, and Richthofen, Deutsche Kolonial Zeitung, August 11, 1898.
93. Dr. Tiessen. Deutsche Kolonial Zeitung, 28th July, 1898, p. 269.

XIII.—*From the Baltic to the Caspian: A Voyage across Russia.*

By Sam. Mavor, F.R.G.S.

[Read before the Society, 12th April, 1899.]

Last year there was built by Sir William Armstrong & Co., on the Tyne, a small, shallow-draught, paddle steamer for plying on the Volga delta between Astrakhan and the Caspian Sea. The little vessel was to paddle her way from Newcastle to the Caspian *vid* St. Petersburg, the Neva, the Great Lakes, a canal system, and the Volga, a route rarely followed in its entirety. Her owners, a Russian Transport Company, placed at my disposal one of her four cabins and a hospitable invitation to go as their guest on the little ship to Astrakhan. Other plans for a journey in a quite different direction were promptly cancelled in favour of so attractive an itinerary; and in the beginning of last June I sailed under the Russian flag from the same shipyard which, by a coincidence, I had left just twelve years earlier under the Japanese flag.

Our argosy was the size of an average tug. Her movements were therefore lively, when off the Dogger Bank she had to be "hove to" for a day in a whole gale of north-west wind and a heavy sea. But after rounding the Scaw the unrest of the German Ocean was left behind, and comfort was again possible. The Sound at Elsinore presented such a scene as must have been familiar at harbours like Falmouth and the Scilly Isles in the days before iron and steel were taught to swim, and when great fleets of merchantmen waited the favouring wind to waft them into or out of the English Channel. The Baltic trade is still largely held by sailing ships, and there lay anchored at this focus of the traffic, weather-bound by the north-wester we had experienced, nearly two hundred Baltic traders. Behind the old fortress of Kronborg, which commands the Sound, lies a garden where the curious may see, on payment of the small fee of 25 öre, the toad-haunted cairn which marks the grave of the legendary Hamlet, and the well where sighed the unhappy Ophelia. The

voyage to the Gulf of Finland was continued in perfect Baltic summer weather, with bright skies, smooth seas, strong sun, and cool breezes.

In anticipation of the Custom-house examination at St. Petersburg, the last day at sea was occupied in tacking, screwing, or otherwise fixing to the structure of the ship all such movables as mattresses, cushions, pillows, and the like. The vessel being destined for the interior was subject to import duty. The duty payable on the hull is based upon the measured tonnage, and everything secured to the hull passes with it. The importance of making temporary fixtures will therefore be apparent.

In the Gulf of Finland, and at about two o'clock on a morning clear as crystal, there appeared above the horizon the massive granite forts of Kronstadt, the imposing portals of this northern gateway to a mighty empire. But these gigantic forts, built by Peter the Great in the picturesque three-decker days, have outlived their military significance. The guns that now render Kronstadt impregnable are mounted on disappearing carriages and concealed in long lines of low-lying batteries. After preliminary Custom-house formalities, the forts are passed, and the broad and shallow Bay of Kronstadt is entered. And here, on a clear day, is afforded a striking illustration of the fact that St. Petersburg is built upon a level swamp, for, rising from the horizon and apparently out of the water, is a group of slender pinnacles and rotund domes, whose gilded surfaces glitter in the sunlight. The tallest of these are the spires of the Admiralty and of the Cathedral of the Fortress of SS. Peter and Paul, and the dome of St. Isaac's. Beneath and around them, but still below the horizon, lies St. Petersburg, and in the great beyond stretches Russia, with her toiling millions of the docile subjects of the Tzar.

No account of travel in Russia is considered complete without an incident relating to a passport. I can meet, in a mild way, this quite unreasonable demand. We had no sooner dropped our mudhook beside the Nicholas Bridge at St. Petersburg than several strangers clambered on board and shouted my name repeatedly. The visitors entered the little deck saloon and descended to my cabin, calling for me in loud and peremptory tones. On opening my door three burly police officers were discovered filling the alley-way with their bulky persons, while one of them demanded, with ominous asperity, my "passport." While rummaging for my passport I had visions of being promptly packed off home

again from the threshold of my journey, and when in the act of handing the passport to the official I discovered, to my horror, that it was not my own. Instead of my Foreign Office passport, here was one by the Lord Provost of Edinburgh, and in favour of someone else. The document was carefully scrutinised by the officer, leisurely folded, and placed in a pocket-book. He then produced another parchment, and, with dignified, but to me irritating, deliberation, unfolded it. This, to my intense relief, proved to be my very own passport. The explanation was simple. The Consul at Newcastle, to whom my passport was sent for *visé*, returned, in error, the wrong one. And owing to the fortunate circumstance that our little vessel was not registered to carry passengers from England, the captain had, in the Russian Consul's Office, entered me as cook, or stoker, or other nominally useful member of the ship's company. The Consul thus happened to know where I should cross the frontier, and mailed my passport to the police, otherwise the consequences would have been extremely awkward. The passport regulations, however, are really very simple and easily followed, and, with reasonable care, no trouble need be experienced.

Our little ship was held fast for ten days by the red tape or rope of the Custom-house, but this afforded opportunity for visiting and gaining some glimpses of Russian home life in the "datchas" or country houses, for which St. Petersburg is forsaken in summer time. It is impossible to speak too warmly of the frank and genial hospitality of the Russians, of their kindly temper, and the *camaraderie* of their family and social life. One of the datchas visited was at the mouth of the Narova river, on the shore of the Gulf, and, by a curious coincidence, close to the scene of the shipwreck of my mother, who, as a girl, accompanied her father to Russia more than half-a-century ago. This datcha, built, as is usual, of timber, with its gardens, grounds, and pavilions, is situated in a clearing of the pine forest, which, in a state of nature, entirely surrounds it on the landward side. The proprietor, a St. Petersburg manufacturer, devoted much interest to his hot-houses and orchard. The latter, in such a climate, is rendered possible by building around it the timber framework of a large shed. In winter the whole space is boarded in and artificially warmed, and in summer the boarding is removed and the trees are open to the sun and rain. That our host had travelled much abroad was vouched by the walls of a smoking

châlet in the grounds, for these were entirely papered with hotel and railway baggage labels, which afforded a pictorial compendium of his journeys.

On our last day at St. Petersburg it was arranged that the little steamer should take a pleasure party of her owners and friends for a sail down the gulf. With the pic-nic party there came on board a priest—a giant in stature, with copious white beard, and abundant snow-white locks tumbling profusely over his broad shoulders and back. He was accompanied by a deacon, also a burly and amply-bearded churchman, an acolyte, and a uniformed servant, the last carrying in a brass-bound box the priestly vestments and sundry ecclesiastical properties. This group was to perform the ceremony of christening and consecrating the vessel. The whole party gathered into the little deck saloon, and the crew crowded round the doors with uncovered heads and reverent bearing. The ship's "ikon" or holy picture, was set up on the saloon table, and before it the priest prayed long, loud, and sonorously, and the pungent smoke of burning incense from a censer swung by the acolyte soon densely filled the little cabin. Neither the dignity of the priest nor the solemnity of the ceremonial could subdue the humour arising from the involuntary and simultaneous coughing and sneezing of the entire party. The acolyte then brought a silver basin filled with water, which, after blessing, the priest sprinkled by an herb brush, first upon the ikon, then upon the people, and afterwards over the whole ship, including engine-rooms, cabins, crew's quarters, galley, holds, &c. When the priest, preliminary to mounting a ladder-way in making his visitation of the ship, gathered together the skirts of his richly-embroidered robes, there seemed something incongruous in the big, business-like sea-boots that were discovered under his sacerdotal finery.

These consecrating ceremonies are universal in Russia. When a house is built the priest must come and consecrate it before it is occupied; or when a factory or mill is erected the ceremony must be performed ere work is begun. Even machinery is sprinkled with holy water and blessed before being set in motion.

Travel in Russia is often said to be monotonous, and so from west to east it may be, for one may journey from the confines of Poland far into the heart of Siberia without ever really emerging from the interminable forests and swamps save to cross the Urals.

Or, by a more southerly route, he may still travel for many hundreds of miles over the viewless tracts of the arable plains without relief to the dull horizontality of the scene. But if one traverses the continent from north to south he will have unrolled before him all of contrast and variety that Russia has to offer. From the Arctic tundras of the north, where the reindeer of the nomadic Samoyed browses on the yellow moss, southward through the region of lake and forest and marsh, and then in succession over the cultivated plains and the grassy steppes, until finally he reaches the arid wastes of the south and east, where the camels of nomadic Kirghis graze on the sun-dried grasses of the desert. Travel by land in any direction in Russia may, however, become monotonous. The chief interests are centred in the towns. These are widely distant, and the discomforts of travelling are considerable. One soon tires of being bumped and shaken in a tarantass over the dust-covered tracks that serve as roads, and travel by rail is slow, hot, and dusty. It must be remembered that the summer aspect of the country is referred to, the winter conditions are strangely different. There can be no doubt that for those who can spare the time the proper mode of travel in Russia is by her waterways. Russia is rich in splendid rivers, and these natural waterways are supplemented by many important canal systems, and so it is possible to sail over Russia, from the Baltic to the Caspian, and almost from the White Sea to the Black Sea. Between the Neva and the Volga there are three systems of canal communication. The Mariinski system, which is the most easterly, was the one followed in my journey. Its route is by the Great Lakes and a series of canals and rivers to Rybinsk, on the Volga. Although the longest, this is the most important of the three systems, and carries by far the largest traffic.

Without pausing to describe St. Petersburg, let us start on the voyage to the interior. In the small hours of a June morning the *Nadejsda* cast off her moorings, and paddled up stream, past the splendid palaces and Government buildings that flank the stately Neva. The first bend brings into view the new Cathedral being built to mark and consecrate the site of the assassination of the Emperor Alexander II., the liberator of the serfs. A few miles higher up is another new church, which also has an interesting origin. On the site of this church there stood a few years ago one of the small shrines of which there are many hundreds, probably thousands, in St. Petersburg. One day this shrine

was struck by lightning, and the ikon and offertory thrown down. The lightning, in its path to the earth, fused some of the copper coins to the metal work of the ikon. The clergy were quick to seize the opportunity, and it was announced that the saint had miraculously accepted the offerings of the people. The ikon was set up again, and immediately was visited by immense numbers of the orthodox, who brought their offerings. In so great veneration was the ikon held that pilgrimages were made to it from remote parts of the country. During a former visit, when I passed the spot daily, the mean little shrine from morning till night was crowded, and a long queue of devotees stretched from its door far down the road waiting their turn. They were of all classes, from unkempt pilgrims, in sheepskin coats and birch-bark sandals, to elegant ladies, who came in equipages with liveried servants. In a few years this splendid church was reared upon the site of the former shrine, and paid for by the pence of the pious pilgrims.

The broad waters of the Neva carry to the Baltic an immense volume of Russian produce. Fleets of laden barges, their voyage ended, lie at anchor in the stream, and acres of timber rafts, floated from the far interior, swim down this highway to the sea. Above the city the river is fringed by immense factories, where the one time docile mujhiks are being transformed into an industrial class that already babbles of its rights. On leaving the factories astern the great, silent, forest land is entered, and there is little to remind one of the neighbourhood of a brilliant city save the contrast between the mean log huts of the peasantry and the pretentious palaces of the capital. St. Petersburg, although the administrative centre, stands apart from Russia, separated by hundreds of miles of forest and inhospitable swamp from the cities of the interior, which are more truly representative of the national life and character. The Neva, from St. Petersburg to its source at Lake Ladoga, is only about forty miles long. Its banks are low and unattractive, but the river, broad, deep, and rapid, with its never-ending procession of rafts and barges steered by strange men converging to St. Petersburg as to a focus from the distant north, east, and south, is rich in interest.

The Neva, at its outflow from the Ladoga Sea, is divided into two channels by a low, rocky island, whose surface is covered by the ancient fortress of Schlüsselburg. The fortress has long been used as a State prison, and its dungeons swallowed up many a victim of the caprice and cruelty of the tyrant women and their

satellites, who, during last century, ruled in Russia. In later times the grim, old fortress has been the tomb of many a noble hope and aspiration, and the cage of many a turbulent spirit, for, during the reigns of the late Emperor and his father, many of the leading revolutionists and nihilists were, and still are, imprisoned there.

We were accompanied to this point by a Scoto-Russian friend, of whose father's life the following incident is worth relating:—He was a native of Perthshire, and, when a young man, had been appointed chief engineer on the imperial yacht in the time of Nicholas I.—the Iron Despot. The Tsar one day sent for the engineer, and "What is your name?" said he. In replying to such a question in Russia you give your own and your father's Christian name. The engineer's reply was therefore "Murdoch Lachlanovitch" (Murdoch, son of Lachlan). "Good heavens," cried the Emperor, "what a name! Rename him, somebody." "Ivan Vassil'itch" suggested one of the staff. "Be thou Ivan Vassil'itch" commanded the autocrat, and by that name the engineer was henceforth known.

After a short stay at the little town of Schlüsselburg on the adjoining mainland, the Neva pilot was dropped, and we steamed past the sombre, granite stronghold, whose gloom was lightened only by the sunlight flashing from the gilded spire of the fortress church and from the bayonets of the grey-coated sentinels. We were now afloat on the Ladoga lake, and amidst curious timber-laden craft sailing under archaic rigs. Their high, bluff stems and sterns, peaked bowsprits and jib-booms, and enormous square topsails were relics of a past era of navigation. Spars of steel and double topsails have not yet invaded these inland seas where timber is plenteous and labour is cheap. On entering Ladoga the rafts and barges are left behind, for these frail and shallow craft, built only for canal and river navigation, are not to be trusted on the lakes. Ladoga, Onega, and Bielo, like all inland seas, are subject to sudden and violent storms, and in order to evade these, canals have been dug, which closely skirt the shores of the lakes, and carry the barge traffic round them. Our vessel, of more substantial build, crossed the open lake to the River Svir, which flows from Onega into Ladoga, a distance of about 130 miles.

Our first stop on the river was at the village of Lodeinoie Polie. Here the captain and the company's agent came ashore, and in the

church they purchased candles, and, with much crossing of themselves and kissing of the floor, placed the lighted tapers before their favourite ikons. At every opportunity this rite was repeated, and always when casting off the shore ropes on leaving a village, and again at the next stopping place, the captain and pilot would face the nearest church, and devoutly cross themselves. The Russian always crosses himself when passing a church or shrine, and at the beginning and end of every undertaking, however trivial. In our little saloon, before and after meals, jovial faces are straightened for a moment, while the ikon is devoutly saluted. The poorest peasant drawing from his little canvas sack a chunk of hard black bread will cross himself ere he breaks it.

In the Svir river we are again among the rafts and barges, all at this season going down stream towards St. Petersburg. This river is more rapid than the Neva, and, although not so wide, is much more picturesque. The pine-clothed banks rise gradually to an elevation of 100 to 200 feet, and occasionally exhibit scanty patches of cultivation. There are many log-house villages, whose people are engaged in the timber trade. Women, as well as men, not only handle the timber but saw it. The big, sturdy women work in pairs, see-sawing the long blades with monotonous rhythm across the logs, tirelessly as machines, and the vast piles of sawn timber are witness of many a hard day's toil.

The villages here are of the better class. Situated on a trade highway to the capital, the peasants earn more than in remote parts, and the large proportion of women at outside work tells of husbands and brothers winning summer wages in St. Petersburg. The women, too, are expert boatmen. One young girl brought us off a boat-load of pilots—six of them—and they sat still while she cleverly handled their craft. These local pilots were additional to the through pilot to Vytegra, whom we shipped at Schlüsselburg. The Svir is very rapid, and the navigation difficult, so that the pilots specialise, each taking a short reach of the river, and half-a-dozen of them were used up in a distance of 15 to 18 miles.

At Voznesenskha, where the Svir river emerges from the Onega Sea, was a vast congregation of rafts and barges converged from many directions, and awaiting their turn to be towed down stream in groups of 2, 3, or 4. The rudders and tillers of the barges are of ponderous size to meet the necessity for prompt and complete control in the navigation of the rapids and shallows. The tillers are great spars, 50 or 60 feet long, like the boom of a big cutter's

mainsail. A light plank bridge is thrown across the barge near the forward end of the tiller, and on this the vigilant steersman stands. At critical parts all hands man the tiller, and when the helm is put hard over the boom is pushed right outboard by a long boat-hook. Till reaching Voznesenskha we have burned the coal brought in our bunkers from Newcastle, but this being now exhausted, the bunkers are filled with timber fuel, and on reaching the Volga the timber will, in turn, be discarded in favour of petroleum from Baku.

About five hours' steaming across the southern end of the Onega Sea brought us to the Vytegra river. The river, for 6 or 8 miles from its mouth, is narrow and tortuous, and the banks, like those of the Onega, are low-lying and marshy, with dark forest background. There is just room for us to pass, and as the paddles draw the still water from the banks the tall reeds bow their slender stems in courtesy as we approach. The day was hot and quiet, and there was no sign of human habitation. But we were not alone, for from these desolate swamps there swarmed upon us, in incredible numbers, mosquitoes and huge, loathsome, poisonous flies. Those of us who had light clothing were darkened by the countless mosquitoes alighting upon them, and the big, stealthy, venomous flies (like our cleg, but many times larger) were thousands. When a traveller tells of mosquitoes he has experienced, his listener, if he can find one, surveys him with an incredulous but indulgent smile, and mentally concedes the same kind of license that is the angler's privilege. There is some ground for this attitude, for there is that about the mosquito (it may be in the poison he inoculates) that degrades the moral sense and stimulates the exaggerator of its victim. But after making all usual allowances, the irreducible minimum of truth remains, that in venom and reckless persistence the mosquitoes of these northern swamps have nothing to learn from their cousins of the tropics.

From a point about 8 miles from its mouth the Vytegra river is canalised, and forms part of the Mariinski route. On reaching this point we were again among our friends the bargees. Our entrance to the canal was barred by a big barge lying right across the river. The expenditure of much forciful language proved quite futile, but the offer of a rouble quickly cleared the way. If vehemence of expression affords a clue to the strength of language, the Russian bargee is easily a match for any Western

competitor. The canalised portion of the river is picturesque, and resembles the upper Thames. It is alive with traffic, and for the remainder of the day we incessantly scrape against the big wall sides of passing barges. This close touch with the moving panorama of river life is full of interest. Here the barges are towed at sluggish pace by teams of horses. Some of them from the arctic North are manned by shaggy crews, whose yellow beards and flaxen hair tell of their northern home; others are from the distant South, with dark-skinned Tartars at the helm. All, deep freighted with the produce of the land, are wending slowly towards the sea; in later summer to return bearing to a rural people the manufactures of the industrial West. And then the navigation ceases, and for six long months the country is held in the iron grip of a polar winter.

In the evening twilight the church domes and spires of the little town of Vytegra rose over the distant pines, and we were soon moored at the wharf, and undergoing the inspection and criticism of an interested crowd. Just above Vytegra the Mariinski Canal is carried by a series of locks over rising ground, which forms the watershed. As the locks were too narrow to admit the *Nadejsda* with her paddle boxes, these and the paddles were to be removed, to be replaced after passing the sluices. The little steamer was, therefore, to be delayed for some weeks, and here I had arranged to leave her.

But on the morning after arriving at Vytegra my ankles and feet were so hideously inflamed by mosquito and fly bites that the doctor had to be called. In the forenoon a portly and perspiring man of pills arrived in the ruins of a drosky, drawn by the ruins of a pony, and driven by a tiny urchin in the ruins of a shirt and trousers. He laid me on my back, propped high my feet, and swathed them in crushed ice and copious lotions, and so for ten days I remained. The time was not lost, however, for lying under awnings on the deck one could watch the ceaseless traffic on the river and the towpath, and wage a vengeful war on the pestilent flies who soon could only reach their victim through a zone of their messily slaughtered kind.

The Russian peasants travel long distances by their waterways, and small boats often passed us carrying groups of men and women. When women were of the party they nearly always did the work. Trudging sturdily along, straining at the tow-rope and dragging a boat-load of lazy and often drunken men, or sitting in

the forward end of the boat steadily plying the oars while the men drank or sang or shouted or slept, the patient women toiled. On the wharf all day women laboured carrying heavy sacks upon their backs, handling timber, driving carts, and towing teams, and riding astride of horses. No wonder the Russian mujhik's cabin lacks cheer and comfort. While young the women are quite comely, but their hard life soon robs them of their youth, and they become prematurely old and even repulsive-looking—shapeless, uncouth creatures, whose features are coarse, and whose expressions are hardened by strenuous toil and exposure.

Who can tell how much a country loses by imposing such conditions on its women? But we must remember that in Northern Russia the winter is long, the summer is short, and the people are very poor. While genial weather lasts all must therefore work at transport, at forestry, or in the meagre fields, wresting from the ungenerous soil a scanty harvest. Their dress is a cotton kerchief tied closely round the head, a loose blouse or jacket of yellow, scarlet, or bright printed cotton, and a short printed cotton skirt. Their lower extremities are naked, or are encased in big topboots, which, as one is given frequent opportunity of observing, are worn without stockings. The feet are, however, swathed in cotton bandages before the boots are drawn on. But the rugged exterior of the women does not conceal their gentle, kindly eyes; nor does the absorbing struggle for existence ruffle their unmurmuring patience or mar their placid stoicism. There is a great pathos in the quiet fortitude and dumb endurance of these sad-faced, Russian women.

The men are shaggy and unkempt, with no headgear but nature's own; this, however, is abundant, for their hair grows long and tumultuously, giving their heads the appearance of big, yellow chrysanthemums. They wear their red cotton shirts outside their trousers, and their trousers tucked into high boots. Lacking dignity, they are still not without a native courtesy and politeness, not only to strangers, but to each other. The men, too, bear the impress of close and unequal contest with the climate and the soil. Their life of dogged struggle for existence has bred in them a sluggish habit of endurance. There is no spring, no buoyancy, in the step of these stolid men, whose grave and solemn faces reflect the dismal lives they lead. In their struggle against natural disadvantages they are still without many of the aids which the sciences and mechanical arts

have developed in Western Europe and America. They are, therefore, more primitive and more subject to their environment, and it is important that this be kept in view when forming an estimate of the people.

But even the mujhik has his times of relaxation. The "prazniks," or holy days appointed by the church, are frequent, and then the peasants cease their work. The men who have no outdoor games or other occupation too often spend the time in drinking. The evenings of a praznik and a Sunday spent at Vytegra were made hideous by the shouts and songs of vodka-drunken mujhiks. The spirit carries them through a high state of jubilation which gradually subsides into unconsciousness. Elsewhere than at Vytegra I saw very little drunkenness, and never a drunk woman. Many of the offenders here were in passing boats, and the journey being a break in their laborious lives, the opportunity for an orgie was seized. The Russians are extremely fond of music, and the still evenings on the canal were often enlivened by plaintive melodies or boisterous choruses sung by the people. Nearly every barge carries a wheezy melodeon, and their music heard from over the water in the quiet nights, was not unpleasing.

A group of Russian-speaking gipsy women visited us one day plying the Romany trade of fortune-telling. Their finely-moulded features, dark complexions, merry eyes, and lissom figures, contrasted notably with the coarser types and dull expressions of the natives of the swamps and forests, and strongly marked them out as wandering aliens in this northern land.

My last afternoon at Vytegra was amused by a litter of young bear cubs. A farmer close by had killed the old couple, and captured the family, of which he now wished to dispose at the rate of six roubles (about twelve shillings) each. The little, furry, black creatures, with bright beady eyes and gleaming teeth, were amazingly plucky and fierce, but were too young to be dangerous. When one of their number was caught and held, the others all showed a bold front, and, growling, made short rushes towards the captor, as if to frighten him into releasing their little brother. One of the cubs was purchased and taken on board.

The evening of this last day before leaving the *Nadejsda* and my most kind and hospitable shipmates was a rather trying one, for a little supper and a big toast list were arranged. The drinking customs of the Russians correspond to those of our great grandfathers, and it is therefore difficult on such an

occasion to be temperate without being misunderstood. Our party consisted of the captain—a Little Russian from the Crimea; the mate—a Courlander from the Baltic provinces; the chief engineer—an Astrakhanski; the company's agent—a Great Russian who had lived mostly at Bokhara; and the local "Ispravnik" or chief of police. As a token of goodwill the parting guest was adopted as a brother of his hosts in the Russian fashion. The initiation consists of interlocking arms, and drinking with, and kissing on the lips, each in turn. To a foreigner who is at all fastidious about what he kisses, this ordeal is decidedly embarrassing.

To avoid the delay involved by passing through the locks above Vytegra, I drove by troika to Andrievski, about twenty miles distant. The conveyance was a kind of small mail phaeton in a very dirty and much battered condition. The harness was rotten, and patched with rope and string. The horses were light limbed, lean, and unlikely looking, but the speed and endurance of these little Russian horses is amazing. In picturesqueness the troika is unsurpassed. The centre horse, the tallest and a fast trotter, is harnessed to the shafts, with his head held high and straight by a bearing rein. The outside horses, which are lighter and loosely harnessed, go at a gallop, carrying their heads well outwards. The driver, using both hands, takes a short grip of the reins, and with never a whip, but with many coaxings and cursings, urges his willing team to the furious pace that only fire engines are allowed to go elsewhere. In style and dash a Russian troika in full career is most like an ancient Roman chariot in a race. The Russian roads are execrable; we should only call them tracks. There is no attempt, not even pretence, at road-making. In a country so thinly peopled, where distances are so great, where stone is seldom available, and where the climate is so severe, the difficulties of road-making are obvious.

The horses are changed at frequent intervals—about 12 miles—and between the stages they are urged to a wild gallop. The driving is simply heroic. The shouts of the driver, the mad galloping of the horses, the jingling of the bells, the straining of the harness, and the rattling of the trap as the crazy thing is dragged, jerking and jolting, over mounds and ditches, are exciting, until they become fatiguing. And this is soon, for it requires constant vigilance to avoid being thrown out. Driving is the only thing a Russian does in a hurry, and the pace is in no way

prompted by necessity for haste. On this occasion my jehu set me down at Andrievski nearly two hours before the time given him.

From this village a small steam canal-boat plies to Bielosersk, on the Bielo Sea. The canal must have been made at great cost, and is magnificently maintained by engineers under the Ministry of Communications. The retaining works, locks, sluices, &c., are built entirely of timber, and are very handsomely carried out. The methods of adapting timber construction to the special requirements are often most ingenious and interesting. The great abundance of timber in Northern Russia has led to its use for all sorts of purposes, and to the retention of appliances and utensils which appear most primitive to one accustomed to the modern applications of metals. Even on many of the great barges the only thing of metal to be seen is the anchor, and this is of metal because a timber one would float. But everything else, the capstan, the windlass, and even the pumps, are made solely of wood. After about twenty hours' steaming the little boat discharged her living freight of peasants at Bielosersk.

Bielosersk may be taken as a fair type of the smaller towns of the interior. The most striking features of all Russian villages and towns are the churches. They are painted white, and from a distance the groups of spires and pear-shaped domes, covered with glittering metal or spangled with golden stars upon an azure ground, are picturesque. But they are crudely built, and do not bear closer inspection. After the churches the fireman's watch-tower is most prominent, for the "red cock" often flaps his lurid wings over these poor, timber towns. The streets are regularly planned, wide and spacious, but are destitute of paving, and seldom enlivened by shops. In the principal streets a narrow raised plank sidewalk is provided for passengers. The houses, as a precaution against fire, are isolated from each other, and, being built of so perishable a material as wood, they nearly all exhibit signs of dilapidation and decay. Timber buildings, if they are to retain their smart appearance, require frequent repair. If repairs are neglected, the structures soon lose their shape, and become shabby and disreputable. There are seldom many people to be seen, and the wide, grass-grown, empty streets and vacant spaces have a desolate and depressing appearance.

From Bielosersk a somewhat larger canal-boat plies to Chiaka, on the Sheksna river. The canal after leaving the town skirts

the Bielo Sea—the last of the chain of great lakes—and is separated from it only by an embankment, over which the broad sheet of water is seen spreading to the horizon. Near Bielosersk is an extensive steam saw-mill, where gangs of women laboured, building sawn planks into high stacks or loading barges, while men gangers stood in commanding positions directing operations. On the warm summer evenings we passed many men, women, and children enjoying the luxury of a bathe. The men are often powerful, and the women expert, swimmers.

At Chiaka a transfer was made to a steamer on the Sheksna river. Since leaving the *Nadejsda* like a winged duck at Vytegra, with one of her paddle-boxes and wheels removed, my travelling companions had been peasants only, for the route, although a great trade highway, is quite a by-way so far as through passengers are concerned, and it is clear from the interest excited by a stranger that visitors from the outer world are rare. The steamers on the Sheksna river are similar to those on Loch Lomond, and the change from the small canal boats was a welcome one. The feeding, although tolerable in quality, had been absolutely without variety. Vermicelli soup, with a bit of chicken boiled in it, is not to be despised; but when served three times a day, with a lump of sour, black bread, it becomes tiresome.

The Sheksna is a tributary of the Volga, and at Chiaka our long down-river voyage to the south begins. We pass fleets of barges as before, but now in this broad river we can go at speed, while they must steer their toilsome course against the rapid stream. Some are towed in groups of three or four by powerful tugs, while others singly have a team of 20 straining horses to slowly drag their bulky deadweight up the stream. The towing industry on these rivers and canals supports a large amphibious population, who live *en famille* in house-boats, and drive their long lines of struggling horses on the tow-path. The Sheksna winds through undulating forest lands in a course so tortuous that at many points the isthmus formed by a bend is canalised to give a shorter passage for the traffic.

These northern woodlands do not present the variety, the luxuriance, nor the tangled undergrowth of a tropical forest. On the contrary, the trees are monotonously alike, and the countless millions of gaunt and leafless stems are meagre in size, and there is no timber of imposing dimensions. But in this southward journey, as the lower latitudes are reached, the hardy fir and

ruddy-pillared pine no longer reign alone, for forests of the silver-stemmed and graceful birch now share the land, and later, down the Volga banks, the oak, the willow, and the poplar in succession take their place.

At Tcherepovetz, the principal town on the Sheksna, a day was spent, and this by good fortune was a market day, and peasants trooped into the town from all directions. The variety in design of the country vehicles is only equalled by the rudeness of their construction. They are entirely of wood, and among the commodities in the market portions of carts were prominent. A man would purchase a cart body or skeleton of the style he favoured at one stall; at another, a pair of wooden axles; and at a third, a set of wheels, also solely of wood. The wheel tyres are formed of saplings of the required thickness, bent into approximately circular form and spliced. The mixture is taken home and a cart is evolved. The mujhik is an expert in the use of the axe, and with this tool only he can quickly build a house and furnish it, or make a raft, a boat, or canoe. Many of the small canoes on the Sheksna are simply "dugs-outs," like those of primitive people elsewhere. Tcherepovetz is partly paved, and a drosky was chartered for a drive round, but the jolting was so outrageous that we quickly called for mercy, and preferred to get out and walk in the broiling sun. The journey from Tcherepovetz was continued in another and larger steamer. The weather here was intensely hot, and often in the afternoons thunderstorms came in terrific bursts when the Chariot of Elijah (who in Russia has succeeded the pagan thunder god) flashed from the heavy clouds and the air was shaken by the rumble of its wheels. But the evenings are cool, and the charm of the long twilight and the rapid down-stream motion amid the sombre pine woods makes one reluctant to quit the deck.

Just before sundown one quiet evening on the Sheksna we were moored to a little floating chapel on the bank, and nearly all on board went to prayers. The chapel was too small to hold the people, but many were content to stand outside facing the door, and at frequent intervals bowing and crossing themselves and murmuring irrelevant responses. A group of dirty, unkempt nuns collected coppers, and sold small ikons and consecrated bread, both manufactured in an adjoining nunnery. The service over the vessel moved off, and there remained the stately figure of an aged priest holding aloft the crucifix, and the benediction, in the

deep tones of his sonorous voice, died in the distance, while the simple wayfarers, reverently gazing towards the emblem of their faith, continued to cross themselves and lowly bow until a curve in the river drew the dusky forest, like a curtain, across the backward view. And then the pale northern night draws in, and there is a weird fascination in swiftly gliding down the waveless waters amid the silent and all-embracing forests. The voyager becomes imbued with the spirit of the sombre woods, and begins to dimly understand why a certain sadness is the prevailing note of a people submerged in the gloom of their environment, and subdued by its immensity.

On the Sheksna and on the Upper Volga there are large numbers of churches and monasteries; so many that their domes are nearly always in view, resting like islands on the green sea of tree tops. Some have villages round them, others have only the low whitewashed walls enclosing a thicket of white wooden crosses, where lie in rows monks or nuns, only slightly more dead than their brothers and sisters above ground.

At six o'clock one morning we reached the outflow of the Sheksna river, where, with graceful curve, she pays her generous tribute to the Volga—Mother Volga—whose broad bosom was to bear me to the Caspian, two thousand miles away. This majestic river—by far the largest in Europe—has been a dominant factor in the history of Russia and in the development of her commerce. Its current lured the Russians on to conquest, and, leading them south and east to Asia gave direction to their expansion. Although the waters of the Volga flow into the Caspian, her commerce flows into the Baltic, and St. Petersburg is her commercial port. Opposite the junction of the Sheksna river with the Volga, and on the high right bank, stands Rybinsk, the first town of any importance since leaving St. Petersburg, a distance of 700 miles.

By good fortune we arrived at Rybinsk during an annual three days' fair. The streets swarmed with peasants in their brightest colours, and the fair ground offered an excellent opportunity for a study of the people in their holiday mood. There were many little groups where men squeezed tunes from asthmatic melodeons, while at intervals there stepped into the circle kept clear by the onlookers a young man or woman who danced for their own and the bystanders' amusement. The dances are, on the whole, monotonous, but some are quite delirious in their vehemence and *abandon*.

Camel Carts at Balakòvo.

GYPSIES AT VYTEGRA.

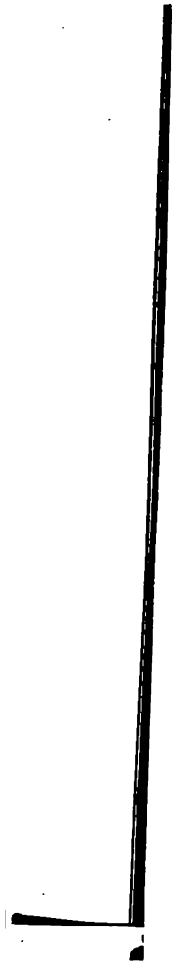
KIRGHIS AT ASTRAKHAN.

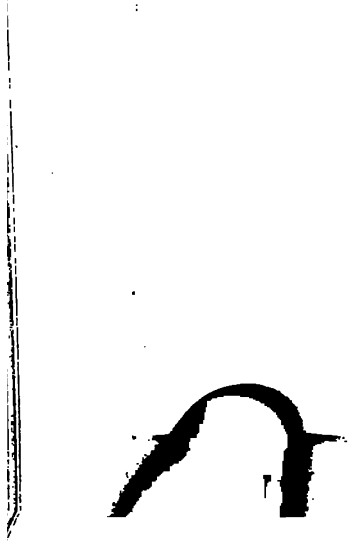
(The central figure is a deaf mute.)

MUJHIK AT TCHEREPOVETZ.

BEGGING MONK.

KAZAN TARTAR.





Russian churches are large and lofty, but there is not space enough to hold with comfort a stranger with sensitive nostrils and a closely-packed crowd of mujhiks. This church was full to overflowing; but seated close by in the open air one could watch the ever-changing groups that stood around each door. The fair hair and blue eyes of the northern people still predominate, but there is now a mixture of dark eyes and swarthy skins of southern races. All passers paused before the church to bow and cross themselves, and many stayed to listen at the door.

A vodka-sodden drunkard staggered forward to front the church. He, with an effort, straightened up his loose-hung frame, and, with trembling fingers, combed the matted locks back from his forehead and revealed a bleared and much-scarred face. Steadying himself on his uncertain legs, he made obeisance twice and crossed himself, then passed on his tottering way. An aged, shrivelled woman, with time-furrowed face and crooked back, supported by a stick, hobbled slowly near the door. For quite an hour this poor, fragile woman stayed before the church bowing and crossing herself, at intervals going painfully down upon her knees and remaining long with forehead on the ground, then with effort struggling to her feet. Only the strength lent the frail creature by her faith could explain the endurance of so great fatigue.

Boys, girls, and little children too, when passing, stopped their play to gravely bow and cross themselves. And prowling round among the simple folk were dirty nuns and greasy monks collecting coppers, and to the donors dispensing their precious blessings.

The fire station at Rybinsk may be taken as typical. The tall look-out tower is reared upon the station buildings, and in these behind the closed doors stand casks of water mounted on four wheels, and each with horses harnessed to it and ready for instant exit. The accessories, mounted on tumbrils, consist of manual pumps, fire escapes, heavy felt blankets, and long poles with iron hooks for tearing down the burning timbers. The whole equipment is obviously inadequate to cope with a conflagration. The chief endeavour in case of fire is to isolate the burning building by tearing down or covering with wet blankets the adjoining houses.

Rybinsk is an important depôt of the Volga trade, for here the traffic is divided into three branches for transport to the Baltic. One portion is carried by rail to St. Petersburg or Riga, another by barges through the two older canal systems, and the third, and

by far the greatest, proceeds by the Sheksna river and the Mariinski Canal route to St. Petersburg. Similarly at the lower Volga towns merchandise is deflected from the river by rail and distributed over Central Russia. But notwithstanding this, the up-stream volume of traffic does not diminish, for it is constantly replenished by grain, hides, fish, flax, and other produce from its tributary provinces. The down-stream trade consists chiefly of manufactured goods, and is greatly less in bulk, although not less in value.

The Volga passenger steamers between Rybinsk and Nijni-Novgorod are handsome stern-wheelers, of the Mississippi type, with roomy and airy cabins. They are painted white outside and in, and, as oil is used in the furnaces, there is neither smoke nor smut to soil them. The luxury of separate cabins was the more appreciated after an experience on one of the Sheksna steamers.

The little common saloon had been shared by an elderly military officer of Falstaffian proportions, whose snoring while awake was intolerable, but at night, when the old warrior slept, the cabin was like some cavern where the wild sea-waves surge and break.

We left Rybinsk at night, threading our way through the fleets of great anchored barges—ships they are without masts or sails. The captain of our steamer had sailed to foreign parts, and knew a little English, as all deep-sea sailors of every nationality do. He was a most jovial shipmate, sang, played the guitar, and generally made merry. He was a bachelor, but it is the custom for the married captains, chief officers, and chief engineers of the Volga steamers to have permanent and roomy quarters on board for their wives and families. Indeed, some of the vessels carry so many wives and children that they almost seem to be run in the interest of the officers.

The next important town to be reached is Yaroslav, also on the high right bank. Its venerable Kremlin is associated with nearly 1,000 years of Russian history, and contains some grand old churches.

No beggars, as in Spain and Italy, cumber the church doorways, flaunting their putrid sores and hideous deformities. The begging here is monopolised by the church, and worshippers when entering must run the gauntlet of a double row of more or less importunate and dejected-looking nuns. The orthodox service in these stately cathedrals is deeply impressive. The priests and deacons, of imposing stature and dignified bearing, with their gorgeous robes,

abundant and long-flowing hair and beards, their tremendous and strongly resonant voices, give to their functions weight and circumstance. There is no instrumental music nor female voices, but the effect in the lofty churches of the choral singing by powerful and highly-trained male choirs is magnificent. The majestic intoning of the prayers by the deep-throated clergy resounds and reverberates through the vast buildings, and the closely-packed standing congregation (nearly all men) seems strangely agitated as they incessantly cross themselves and sway in their obeisances. No description can be here attempted of the Kremlin and churches of Yaroslav; we must proceed down river.

The Volga, unlike the Rhine and Danube, has no ruined feudal strongholds to crown her banks. Apart from towns the only buildings of importance are the monasteries. The orthodox monks, like the Catholics, had sufficient worldly wisdom to select the most desirable sites for their retreats, and they are generally situated, often picturesquely, at a bend of a river. The next considerable town is Kostroma, also ancient and famous in Russian history, and for a few troublous years the capital. The town has many splendid churches, and on the river bank close by is a large monastery, where the first of the Romānoff (the present) dynasty once sought refuge, and later accepted the crown. About sixty miles lower down is Kinishma, a modern manufacturing town without special interest.

There are now signs that the borders of the wooded zone are being reached, for alternating with the forests there are tracts of cultivated land and of meadows, and occasional herds of cattle seeking coolness and refuge from flies on the sandy flats of the river.

After dinner served on the balcony of the steamer, and while indulging with contented ease in the supplementary luxuries, one can enjoy to the full the changing view, the sweeping down-stream movement which involves no personal exertion. The banks are flanked by dense battalions of tall pines, whose tapering spires serrate the sky line, or they are draped by the dainty foliage of the gentle birch. The intervals between the forests are arable, and stretch, like prairies, to the horizon, burdened with ripening grain, whilst against the swirling waters of the reluctant river the produce-laden barges are towed in endless procession to the north. And always, from out the trees, there shine the glittering domes and whitened belfries of church or

monastery. The rich glow of the sinking sun lends warmth of colour, and the stillness is broken only by the plaintive cry of the river gulls.

On such lovely, restful evenings the clamorous world seems far away. But after such an evening we arrived at Nijni, and Nijni-Novgorod is the busiest town upon the Volga. Nijni is situated upon a most picturesque site, where the Oka, after a course of nearly 1,000 miles joins the majestic Volga. The rivers at their confluence are nearly equal in size, and when viewed from the walls of the old Kremlin the two great waterways can be traced winding through the vast alluvial plain until they taper into silvery threads the eye cannot follow. The Kremlin and old town are built upon the high right bank, commanding a view of extraordinary scope over the level land, which stretches, like an ocean, to the low and distant sky line, and as the day fades into night the sun sinks into the plain like a sunset at sea.

My visit to Nijni was about two weeks before the great annual Fair, and the Fair town, which lies on the opposite bank of the Oka from Nijni, was awakening from its eleven months' sleep. The shops and booths were being opened, and immense quantities of goods arriving. To handle the goods there is a large influx of labourers from the country to the city. The quays and meaner streets are thronged with these immigrants, who represent the many races whose home is by the Volga. Several barracks are provided by the Government for the free shelter of these labourers, and at the door of one of them I stayed one evening while there entered in single file and slow procession 800 of the most mixed, most tattered, dirtiest, poorest, and strangest men it has been my lot to see. They were of all ages, colours, sorts, and sizes, chiefly of the various races of Eastern and South-Eastern Europe, the Slavic type predominating, but sprinkled with Tartars and Mongols. A student of ethnography or physiognomy could hardly find material more rich in interest nor a parallel to its variety. Only the poverty that brought them there was common to them. All looked tired, and many were footsore. Those who did not wear bast sandals were barefooted. Numbers had just reached their journey's end, and carried their baggage—a ragged sheepskin coat—in a bundle on their backs. As each passed he had handed to him from a huge basket a lump of, to me, evil-smelling, sour, black bread, about a pound in weight. All wore an air of deep dejection, as if oppressed by the burden of their almost hopeless poverty.

The officer in charge—a big-shouldered ex-man-o'-war's man, with bushy beard tumbling all over his broad chest to his waist—very kindly showed me over the building. It is entirely of stone, and has six dormitories, each holding 150 men. The rooms are fitted like wine cellars, with iron-framed bins in tiers. The bottom of each division of the bins consists of a thick wooden plank; this is the bed, and is the only wood on the premises. The pillow is a rounded rest of sheet iron. No bedding of any kind is provided, and nothing drinkable, not even water—vodka is a clear spirit—is allowed into the building. The walk through these dormitories presented a sight most saddening and not soon to be forgotten. Every bin was occupied, and many of the way-worn creatures were already sunk in the heavy sleep of exhaustion. But the majority were sitting or reclining in their bins munching their coarse fare in silence, and, like caged animals, looked out with languid interest at their visitor. The crowd to be seen in model lodgings in our cities consists chiefly of wrecks of humanity who have drifted thither by their own incapacity or intemperance. But these men at Nijni, although there were many exceptions, were, on the whole, fine, stalwart, capable-looking men, with splendid physique, and many had grand heads and intelligent faces. Such men as have no business to be poor, and they were—oh! so poor, and in such unspeakable rags. Asiatic and African coolies may be as poor, but they do not look it. A man cannot appear tattered and ragged when he is naked in a climate where he requires no clothes. But these poor fellows looked the poorer for their clothes. Besides, these men at Nijni were of a type immeasurably superior to Asiatic coolies. One could not fail to be impressed with their latent power, and it was difficult to suppress a feeling of resentment at the conditions which condemn such men to poverty so abject. What an utter waste of fine material was here.

There can be no doubt that, when opportunity is afforded them by the further development of their country, there is a very different future in store for these people. It must, however, be remembered that they were the children of serfs, whose traditions told of centuries of serfdom, preceded by centuries of submission to Tartar tyranny. Such a heritage cannot be lived down in a generation. The ignorance of the Russian peasantry, their present poverty, and a despotic Government, still deprive them of inspiration from the Western world. But the time is approaching when they will awake from their lethargy

and emerge from a slumberous past to claim their proper place among the peoples of Europe. When once imbued with the spirit of unrest, and stimulated by the impulse to freedom and progress, no power will daunt the courage nor tire the tenacity of this ponderous people.

It is unfair for us to judge Russia by the standards of Western Europe. She is in an earlier stage of her social and national development. The condition of her people corresponds to that in this country 300 years ago. Her present position has been aptly described as that of a "fast growing youth at the critical age when the face, voice, and character are in the act of being moulded for life." Her growth will be more rapid than was that of Western Europe, for she is availing herself of the mechanical arts and sciences which were the result of slow evolution in the West, and actively developing her own almost boundless resources. Her progress will be less an evolution than a revolution.

The wharves at Nijni, piled with merchandise arriving for the Fair, presented scenes of great activity. No cranes or other mechanical apparatus are used—not even barrows. The goods are packed in bundles or boxes of such size that a man can carry them, and, with large gangs of men accustomed to deal with cargo, goods are transferred with astonishing rapidity. When very heavy weights are handled, the gangs of men while they lift, carry, or haul together, sing, as sailors do, and add much noise to the bustle. The Volga carries many strange cargoes, and among them may be seen chained convicts embarking for Siberia. Nijni has always been a forwarding depôt for this grim traffic, and from here they are forwarded by steamer up the Kama River to Perm, whence they proceed by land. After this year, however, the new Siberian Railway will carry the convicts to the east, crossing the Volga at Samara. Between Nijni and the mouth of the Kama we passed several steamers transporting convicts. Nijni is an important centre of shipbuilding, and all the fine Volga steamers and many smaller river crafts are built here. In the neighbourhood, too, are large barge-building yards, that take one back to the old days when ships were built of timber.

The next town, Kazan, is situated upon the low left bank of the Volga, and is reached in summer by a drive of six or seven miles from the landing stage, but in spring, when the snow melts and the flood comes, the river overflows the intervening plain and reaches the walls of the ancient Kremlin. The modern town,

outside the Kremlin, is quite without interest, and half of it has been destroyed by fire since my visit. The once dominant, but now subject, Tartars are ruled from their former stronghold by a Russian governor, supported by a large garrison. They confine themselves in Kazan to a separate district of the town, and retain their Oriental costumes and customs, but, like the Moors in Spain, these aliens have sunk to the more menial occupations.

Between Kazan and Simbirsk, another great tributary of the Volga—the Kama—after a course of 1,000 miles, pours her tribute into the mighty river.

The Volga now flows through the governments of Kazan, Simbirsk, and Samara—three of the districts sorely stricken by the present famine. The rich grain-bearing provinces of Central and Eastern Russia are thickly populated, and the amount of distress in times of such disaster is enormous. These fertile regions, by their remoteness from the sea, must always be liable to long-continued droughts, and absence of rain at certain seasons means loss of crops and resulting famine. The Government distributes temporary relief, but the measures taken are quite inadequate. The problem of making systematic provision against the recurrence of droughts, which are known to be inevitable, has not yet been faced. By improving the means of transport, establishing an organised system of distribution to be put in operation in time of famine, and by retaining in the provinces a sufficient reserve of grain (instead of each year exporting all that is not required for immediate needs), much might be done to alleviate the effects of drought. The people are so poor that when calamity overtakes them they have no resources to fall back upon, and their present plight, when, after starving and suffering throughout a rigorous winter, their country is flooded by the melting snows, must be pitiable in the extreme.

The town of Simbirsk is, like so many of the Volga towns, situated upon the high right bank overlooking the river. In the neighbourhood of this town, and between it and Samara, is much the most picturesque portion of the Volga. The right bank rises to a height of many hundred feet, and terminates abruptly in fine bold cliffs. This is the only part of the whole course of the Volga that presents anything that could with approximate accuracy be called scenery.

Samara is one of the principal commercial centres on the left

bank, and, with a large eastern trade, is one of the meeting places of Asia and Europe. The new Siberian Railway crosses the Volga here, and its traffic must bring much advantage to the town. The streets of brick-built houses have little interest but for the people in them, who represent a great variety of races. The Russian shopkeeper has not yet learned the advantage of exposing his goods behind glass windows. Instead of exhibiting the goods themselves, he paints effigies of them on large boards, and hangs these out. All of them are very crude, and some are extremely grotesque and amusing. A baker will exhibit painted loaves and buns of every variety, and cut sections of those with currants. A grocer will have painted sugar loaves, tinned meats, pots of preserves, sausages, hams, and the like. An ironmonger shows painted locks, keys, pots, and pans. A barber shows a life-size portrait of himself shaving a customer. Undertakers show painted coffins of every variety, from plain wood boxes to the most elaborately frilled and ornamented caskets, and so on.

Soon after leaving Samara we passed another convict steamer, this time going up river. Nearly the whole of the upper deck forward was covered by a large iron cage, about seven feet high, and with top barred like the sides, the only access being from the deck beneath. In this cage were about fifty prisoners without manacles. We passed quite close to them, and could see that they were all southerners — Persians, Karkas, Cossacks, and Tartars. In a similar, but smaller cage, over the afterdeck, stood one solitary, pathetic figure—a woman's. The prisoners were being taken to Nijni-Novgorod, whence those with long sentences would be exiled to Siberia, and the others to the great State prison at Vladimir.

There is a large passenger traffic between the towns of the Lower Volga, and here, as elsewhere, from the military and civil service officers and merchants down to the shaggiest mujhik, one experiences unfailing amiability and ready courtesy and kindliness. Whatever political antagonism may exist between Russia and Britain is certainly not reflected in the hearing of individual Russians in personal intercourse with Britishers. It is gratifying to find frequent evidence of the respect in which this country is held by Russians, and of their appreciation of the high quality of British manufactures. This goodwill is not extended to the Germans; on the contrary, they appear to be regarded with a decided national and personal antipathy. Germany is on the immediate

frontier of Russia, and enterprising Germans invade the country in great numbers, and enter into keen competition with Russians in official, professional, commercial, and industrial spheres. The diligence, method, and reliability of the Germans have won for them success and the widespread dislike and jealousy of the Russians.

The scrupulous care with which my fellow-passengers locked their cabin doors, and pocketed the keys, even when leaving the room for only a few moments, indicated little confidence in each other or in the servants. The living on the Lower Volga steamers is very fairly good, although on all of them many little passengers travel and share one's berth without paying any fare, and Keating's powder is indispensable. Bed-clothing is not provided, for the Russians when travelling carry their own bed linen and pillows. They have the same kind of objection to using other people's bed-clothes that we should have to personal clothing. On one of the steamers my cabin was shared by a cavalry officer, who, by the way, had a most ludicrous variety of stutter, which always culminated in a shrill, involuntary whistle. He entered booted, spurred, and braided, bearing in one hand a large square feather pillow with white linen cover, and in the other a small basket of provender. When he felt hungry he ordered hot water only, for his basket carried all other necessaries, including tea, sugar, lemons, bread, &c. Many of the passengers carried food in this way, with the result that the steward's department suffered from lack of patronage, and the catering was therefore rather meagre. When beef was available it was hard and tasteless, and mutton was never to be had, but chickens were plentiful, and veal, veal, veal, served in every conceivable form and many inconceivable disguises. Of fish there was the famous Volga sterlet in abundance, and sturgeon and fresh caviare. The last, even on the Volga, is expensive. A quantity which could be held in a port-wine glass costs about 1s. 8d. The grey eggs are large, round, and separate, like pearls, and when iced and served with small green onions chopped, this caviare is indeed a delicacy, and is very different from the sticky black mess sold as tinned caviare.

If violent robbery is no longer the rule among the tamed Tartars who are waiters and stewards on these steamers, they adopt other means of indulging their acquisitive propensities. Former experience had put me on guard, and the detection of their impudently persistent attempts to overcharge became an amusing diversion.

In the same bill they will try to cheat you in the items—in the addition, and in giving change, the errors sometimes aggregating to 40 per cent. in their favour, and they are neither abashed nor discouraged by detection.

In the government of Sarātov the grassy steppes succeed to the grain-bearing region, and the vast herds of cattle, and occasionally of pigs, on the sandy shores and meadows are significant of the change. Immense timber rafts, with log huts built upon them for the accommodation of the navigators, are still a feature of the river traffic. But now its direction is changed, for it is floating down stream to supply building material and fuel for the woodless provinces of the south.

In summer, when the water is low, navigation on the Volga is extremely difficult, and requires unremitting vigilance. The shifting sandbanks and shallows render it impossible to maintain a permanent channel, and soundings must be almost continually taken. In keeping to the channels the big, shallow-draught steamers may be seen crossing and recrossing the river at acute angles, like sailing vessels beating to windward. A man is stationed at the bow taking soundings with a long, light pole and calling the depth to the pilot, while the large double wheel is manned by never less than four and sometimes by six men, who find it hard work to swing the vessel about as the pilot directs. Tales are told (but I cannot personally vouch for them) of steamers having to blow their whistles and slacken speed to avoid collision with a man on horseback crossing the river, and of passengers jumping overboard and walking ashore at the points nearest to their destination.

In this long southern journey, as the lower latitudes are reached, the days become shorter, and the night-long twilight of the north resigns the midnight to the moon and stars. There is a tranquil charm in the swift, silent progress over the placid, moon-lit water when all around is still, and the rhythmic splash of the sounding pole; the long-drawn call of the sounding, as "Pyāt" (five), or "Voĭsēm" (eight), from the man at the bow, and the brief, deep-toned order "Prava" (starboard), or "Lleva" (port), from the pilot to the steersmen are the only sounds that break upon the quiet of the night.

Sarātov is finely situated on the slopes of an amphitheatre of low hills surrounding a bay in the right bank, and its aspect from the river, which here is three miles wide, is picturesque. The

number of spires of Lutheran churches among the domes of the orthodox indicates a large German colony. Sarātov, like other towns of the Lower Volga, is of modern growth. The colonising by the Russians of this whole southern region is of comparatively recent date. The steppes had to be wrested, acre by acre, from the lawless and marauding tribes which roamed them, and contested the encroachments of the plough. The settlements on the ever-advancing frontier were the constant scenes of murder and plunder, as were the American settlements at the hands of the Red Indians. And these villages on the river, now occupied by industrious fishermen, were the nests of robbers and pirates. Peace, security, and prosperity have succeeded to bloodshed, rapine, and devastation. The population is increasing, and the towns are growing with extraordinary rapidity. The prosperity of the towns is, however, largely due to the influx of foreigners, chiefly Germans. A preference for rural life has hitherto been a characteristic of the Slav.

Below Sarātov the villages mostly crown the high right bank, as there they escape the spring floods. Often only the domes of the village church can be seen above the straight sky line of the cliff, but sometimes the villages nestle in clefts and straggle down almost to the water's edge. The view towards the left is over a measureless expanse of vacant plain, stretching, like a dry sea, to the low and level horizon.

At the villages in the borderland, between the desert and the fertile steppes, camels are used for draught purposes. Harnessed to small carts, they are driven in long trains by Cossack and Tartar men or women. It seemed unfair to set the stately ships of the desert to towing mean, little, four-wheeled carts. But the camel's demeanour of lofty superiority, almost of superciliousness, cannot be ruffled by any insult, and he strides along with dignified deliberation, disdainfully pretending that he does not know the cart is there.

Between Sarātov and Tsaritsyn the next important town is Dubovka, formerly the capital of the Volga Cossacks, but now eclipsed by Tsaritsyn, which owes its importance to its railway connection with Kalatch on the Don, only 40 miles distant, and with Central Russia. The Cossacks are big-boned, powerful men, with massive, handsome features, splendid teeth, and big bright eyes that dance with energy and vitality. Of all the peoples on the Volga they appeared the finest, most capable, and most alert.

The wharf labourers went about their work, and it was hard work, with as much breezy activity and good humour as big schoolboys at play. The Russian Government well understands the military value of this magnificent material, and the Cossacks defend her frontiers from Poland to Port Arthur.

Tsaritsyn is a great depôt of the petroleum traffic, and of the immense quantities brought up from the Caspian a large proportion is distributed from here in railway tank-waggons over Central and South Russia. Petroleum fuel is used almost exclusively on the Volga, and at intervals on the river right up to Rybinsk depôt barges are stationed from which steamers may have their bunker-tanks filled through a large hose.

The summer dust of the Lower Volga towns, where it lies on the roads in a fine powder to the depth of a foot or more, is too dreadful for description, and the intense heat adds to the discomfort. It is always a relief to be on board again, and it was specially so on the afternoon we left Tsaritsyn, when a strong breeze was blowing, and at intervals the town was completely obscured by the dense clouds of dust raised by the wind.

The last stage of the Volga voyage is between Tsaritsyn and Astrakhan, where the river flows through the sandy wastes that are a continuation of the deserts of Central Asia. The arid sand dunes roll to the horizon like the waves of a solid ocean. Near the river there are occasional oases, and sometimes a tall poplar rises singly from the plain like a lighthouse tower from the sea. On this portion of the Volga that strange migrant race, the Kalmucks, are settled. They are a pastoral people, but many of them are fishermen. Their tents are frequent on the banks, as are their villages of little round huts of the size and shape of an average haystack, with a hole in one side. The Kalmucks are Buddhists, and some distance above Astrakhan there is on the river bank a large pagoda of the Chinese type and a settlement of the followers of Lama.

Churches are always the most prominent feature of a Russian town, and when approaching Astrakhan the domes of her cathedral tower over the plain long before the city comes into view. But the orthodox churches in the city are few, for there are many Moslems and sun-worshippers.

Astrakhan, the former capital of a Tartar Khannate, and now the chief port of the Caspian, is an animated mixture of Europe and Asia. It was to me the most interesting of all the Volga

towns. It is the focus of the trade of the rich alluvial delta of the Volga, one of the richest in the world. In the creeks and canals which intersect the town lie hundreds of small craft of the size of fishing smacks, with little cargoes of grain, poultry, hides, cucumbers, and other produce. Their crews are Kalmucks, Tartars, Kirghis, Cossacks, Persians, and all the various races of the Caspian littoral. Every boat is the floating home of a family. All carry women and children, and many have cradled infants swinging from their booms. The streets of boats, and the teeming life among them, have quite the aspect of a Chinese river town, but are far richer in colour and variety.

Owing to the shallowness of the river and the northern end of the Caspian, the trading steamers and sailing ships cannot approach nearer than about 80 miles from Astrakhan, and this distance was covered in a tug with accommodation for a few passengers. The afternoon sail between the verdant banks of this beautiful delta (said to be one of the most fertile in the world) was a never-to-be-forgotten one. The bustle and colour and interest of the swarming river life cannot be described. In addition to the ponderous cargo and oil barges, there was a myriad of singularly graceful coasting craft navigated by men, women, and children, whose types were of bewildering variety.

When evening fell, and a cool night breeze succeeded to the glare of a scorching sun, dinner was served on the bridge of the little vessel. The party consisted of the captain, the engineer, their respective wives, and myself. The traffic was meanwhile so great that navigation demanded the most anxious care, for the darkness ahead was so spangled with the red, green, and white lights of other craft that we seemed to be sailing into Clapham Junction. At midnight the wind had freshened to a very strong breeze, and the captain's guest left the bridge to retire to his stuffy little cabin. But to reach this was not easy, for about eighty passengers of mixed sizes and sexes lay huddled closely together upon the iron decks, completely covering them. To walk over this living pavement in the dark without treading upon the face or more tender portion of some sleeper's anatomy required the extremest caution.

Next morning the wind had increased to half a gale, and the sun, heralded by gorgeous colour, rose from a stormy sea into an angry sky, where lurid, wind-torn clouds were chased by a rising tempest. The daylight revealed a fleet of about 200 depôt and

transport barges, Volga tugs, and Caspian traders and oil steamers, all wallowing in a tumbling sea and out of sight of land. It is here that cargo must be transferred from the Caspian steamers to the Volga barges or *vice versa*.

Space does not admit of any account of the Caspian towns visited nor of the Caucasus, the grandeur of whose cloud-piercing peaks can be best appreciated after traversing 3,000 miles of the almost unbroken plains of Russia.

XIV.—*Commercial Education at Home and Abroad.* By JAMES KNIGHT, M.A., B.Sc., F.C.S., F.G.S., F.E.I.S., Second Master, John Street Public School, Bridgeton; Headmaster elect, St. James' Public School, Calton, Glasgow.

[Read before the Society, 26th April, 1899.]

THE present session of Parliament, we are told, is to be largely devoted to church and school. The whole of English education—primary, secondary, and technical—is awaiting systematic treatment at the hands of the Government, along with technical and agricultural instruction in Ireland, while the recent activity of the Scotch Education Department has almost revolutionised our own methods. The empire of the Science and Art Department at South Kensington has for Scotland been transferred to Dover House, and by the recent creation of Higher Grade (Science) Schools a long step has been taken to lessen the distance by which our continental brethren still lead us in specialised educational work. There is not the slightest doubt but that step will before long be followed by another—the creation of Higher Grade Commercial Schools—and it is with the view of forming and guiding an intelligent public opinion on this subject that the following remarks are made.

The term "commercial education," now so frequently heard in educational circles, is used in at least three different senses, so different that a clear distinction between them becomes imperative. *First*, then, it is applied, loosely enough, to *evening* classes in such subjects as book-keeping, shorthand, type-writing, commercial arithmetic, modern languages, and the like, all of which aim at increased proficiency or technique in the human penholder, most helpless of mortals, commonly known as a *clerk*, to enable him to do his work with greater speed and accuracy and with less direct cerebral control; to bring his work in increasing measure under the description of a *reflex action;* and to render the worker a self-winding automaton, rapid, infallible, soulless—at least in business hours.

Secondly, the term commercial education is applied to the more systematised course of a *modern*, as distinguished from a *classical*, school, a school in which the university tradition has been more or less openly abandoned; where Latin and Greek

have given place to French and German; where higher mathematics, taught to the few, has been succeeded by elementary science, taught to all; where the course of study has some *intentional*, not merely *accidental*, connection with the realities of life; where at least the closing years of the curriculum form a deliberate and calculated preparation for world work. This type of school is seen at its best in the Realschulen of Germany, and we in Scotland are only beginning to grope our way towards it in the "Higher Grade Commercial Schools," which do not yet exist, save in the pigeon-holes of Dover House.

Thirdly, and for illustration of this we must cross the Channel, commercial education refers to that highly-specialised training, coming as the crown of a long and broad secondary education, which aims at doing the work of a commercial Woolwich or Sandhurst, that is to say, of training the *officers* of the commercial army, as distinguished from the rank and file, producing men who, while they know something of everything, know everything about this one thing. As examples of this *technical* development of commercial education, I am regretfully compelled to direct your attention across the Channel, to the work being done in Paris, Leipzig, Antwerp, and other continental centres.

Having now laid down these hard lines of delimitation, let us attempt to fill in the details. What provision does this "nation of shopkeepers," this nation whose tutelary deity 6½ days a week is *Britannia Agoraia*—Britannia of the market—what provision does she make for training what is, in cities at least, her most numerous class, the business men? Other professions have ample resources for training not only the rank and file, but the officers; for one must face the fact that in every trade or profession, as in society at large, there will be the hewers of wood and the drawers of water, the "average men," "mostly fools," according to Carlyle, meaning by that, I apprehend, those who, through inability to think for themselves, or want of practice in doing so —and the latter entails the former—find it the chief business of their life to do what other people tell them—to obey orders—not a bad thing after all. Modern trades unionism has been enunciating in strident tones the proposition, "The tools to him who can use them;" it has not yet discovered the immediate corollary, "and the direction to him who has the brains." Let us see what is being done in other professions, and I select here two, the details of which are thoroughly familiar—education and medicine.

The boy or girl of fourteen who aspires "to teach the young idea how to shoot" undergoes a four-years' apprenticeship, with Government examinations at beginning, middle, and end, besides local and class examinations, and a 15-hours' working day all through. Then come two years in a training college for the successful candidates, some 30 per cent. only of the applicants, thus making six years' training for even the lowest grade of certificated teacher, Timothy Jenkins, Esq., *C.M.*, the permanent assistant, to borrow a recent and ominous phrase. For the more ambitious a university degree is a *sine quâ non*, besides additional qualifications from the Science and Art Department and kindred authorities, and with all these—"Ye have heard of the patience of Job"—practise it for five-and-twenty years.

Take a medical student. He now finds himself, at the age of 17 or 18, confronted at the door of the university by an entrance examination, compared with which the M.A. degree of twenty years ago was a farce, viz., the higher grade leaving certificate standard in at least four subjects. Having passed his "prelim.," he enters upon five years' hard labour, summer and winter, hearing lectures, working in the laboratories, attending hospitals and dispensaries, visiting "cases" at their homes, training himself for the imperious clang of the night-bell.

His college course ended—and with teacher and doctor every single class has a distinct and practical bearing on the daily needs of daily life—having passed his "professionals" and the dreaded "final," the young M.B. enters upon the serious business of life as assistant to some practitioner for a couple of years at least. After that time he may buy a practice, if he is able, or if not—and he generally is not—he can set up his own brass plate and await developments—and patients. Lucky is he if, in his first year, he can make ends meet, let alone "saut to his kail."

Now let us examine the training of the "business man." When the average schoolboy leaves the VI. or ex-VI. Standard at the age of 14 and "goes into business," to use his own grandiloquent phrase, what is the nature and extent of his mental equipment? He can read—his school book, not a newspaper; can write fairly well if you give him plenty of time and ruled paper—perhaps, in view of recent caligraphic changes, I ought to say *could* write; but his spelling is decidedly shaky, not to say shameless, and his composition weak and childish. He can count, if you give him time and

a slate, and out of a confused mass of figures, which vouch for a considerable endowment of patience and perseverance, he *may*, if not smothered by his own working, evolve some such transcendental answer as £47 19s. 11¾d. $\frac{219}{360}$. Vulgar fractions he knows and handles respectfully; decimals are a foreign language—for him in actual life, a *dead* language. He never uses them; his excuse must be that of Lord Randolph Churchill, who, when Chancellor of the Exchequer, "Never could understand the meaning of these damned dots." Of the whole subject of approximations—of commercial arithmetic proper, exchanges, arbitrations, profit and loss, calculation of percentages; of short methods, mental and otherwise, for extending invoices and calculating interest, he knows nothing certainly, and all that has to be learned at the office. His geography is general—from China to Peru; but he cannot tell how to get from Glasgow to Dumfries or Inverness. For all the years he has spent in French—generally two or three—he has no colloquial knowledge of any foreign language, and is quite unable either to write or answer a business letter.

Such a boy starts his life-work heavily handicapped. His memory has been overworked—I have seen it in a state of paresis—loaded on the Gradgrind system with facts, facts, facts. These latter, moreover, have been administered like the sulphur and treacle at Dotheboys Hall, and only in rare cases has the pupil been allowed to make his own collection or cultivate his own powers of observation. Even at Dotheboys Hall things were not so bad, as will be seen:—

"First class in English spelling and philosophy. Now, then, where's the first boy?"

"Please, sir, he's cleaning the back parlour window," said the temporary head of the philosophical class.

"So he is, to be sure," rejoined Squeers. "We go upon the practical mode of teaching, Nickleby; the regular education system. C-l-e-a-n, clean, verb active, to make bright, to scour. W-i-n, win, d-e-r, der, winder, a casement. When the boy knows this out of book, he goes and does it. It's just the same principle as the use of the globes. Where's the second boy?"

"Please, sir, he's weeding the garden," replied a small voice.

"To be sure," said Squeers, by no means disconcerted. "So he is. B-o-t, bot, t-i-n, tin, bottin, n-e-y, ney, bottinney, noun substantive, a knowledge of plants. When he has learned that bottinney means a knowledge of plants, he goes and knows 'em. That's our system, Nickleby; what do you think of it?

"It's a very useful one, at any rate," answered Nicholas.

"I believe you," rejoined Squeers, not remarking the emphasis of his usher. "Third boy, what's a horse?"

"A beast, sir," replied the boy.

"So it is," said Squeers. "Ain't it, Nickleby?"

"I believe there is no doubt of that, sir," answered Nicholas.

"Of course there isn't," said Squeers. "A horse is a quadruped, and quadruped's Latin for beast, as everybody that's gone through the grammar knows, or else where's the use of having grammars at all?"

"Where, indeed!" said Nicholas, abstractedly.

"As you're perfect in that," resumed Squeers, turning to the boy, "go and look after *my* horse, and rub him down well, or I'll rub you down. The rest of the class go and draw water up, till somebody tells you to leave off, for it's washing-day to-morrow, and they want the coppers filled."

So saying, he dismissed the first class to their experiments in natural philosophy.

Here is another and a more familiar method of treating the same subject, and by the same hand:—

"Give me your definition of a horse."

[Sissy Jupe thrown into the greatest alarm by this demand.]

"Girl number twenty unable to define a horse!" said Mr. Gradgrind, for the general behoof of all the little pitchers. "Girl number twenty possessed of no facts in reference to one of the commonest of animals! Some boy's definition of a horse. Bitzer, yours."

"Quadruped. Graminivorous. Forty teeth, namely, 24 grinders, 4 eye-teeth, and 12 incisive. Sheds coat in the spring; in marshy countries sheds hoofs, too. Hoofs hard, but requiring to be shod with iron. Age known by marks in mouth." Thus (and much more) Bitzer.

"Now, girl number twenty," said Mr. Gradgrind, "you know what a horse is."

You have heard Mr. Squeers, you have heard Mr. Gradgrind; choose ye.

How are we to account for this lamentable result after eight years' training in our elementary schools? In several ways. Teachers are to blame in very many cases for following antiquated methods, notably in the case of English and arithmetic; the Education Department has, with the best of intentions, extended

the original three R's by the addition of "specifics" and other subjects, giving a shilling grant here and a four shilling grant there, till the weightier matters of the law have been neglected. It is not too much to say that in the matter of hand-writing scholars are very much worse than their fathers were. Then again, the inspecting staff is too small to go into all the details of work, so that we find a boy in our secondary department this year because he was in Standard VI. last year, and he was in that because he was in Standard V. the year before, and so on, till we come to Standard I., where we find him *because he is 7 years of age.* The scheme of promotion is as simple as Fate, and quite as irresistible.

I say nothing about School Boards, who have to consider the pockets of the ratepayers, and who, therefore, naturally desire large grants; but in not a few cases they have added to an already overloaded curriculum by introducing special subjects, or by abnormally raising the standard in code subjects.

Fortunately, all this is now ancient history, thanks to the new code of 1899, an ideal educational measure from the point of view of a conscientious teacher. Under this code the three R's regain their rightful pre-eminence, while generous provision has been made for general knowledge and hand-and-eye training, and the merit certificate, now the exit of an elementary school, is also fixed as the entrance gate of all secondary or higher-grade public schools in Scotland.

The subsequent business career of the ex-VI. boy is familiar to you all. During his first year in an office he is more or less of a nuisance, rejoicing in the liberty begotten of "five bob a week" and no school lessons, a liberty against which the seductions of £10 bursaries are perfectly powerless. In his second year he is beginning to know his way about, and by the third he has picked up sufficient to make himself fairly useful. Probably by this time he has discovered, what his employers could have told him from the outset, that the Sixth Standard does *not* cover the whole sphere of human knowledge, and that "there are more things in heaven and earth than are dreamt of in his philosophy." Accordingly, if he be a youth above the average, he attends evening classes in the Athenæum or the Continuation Schools—the Technical College is hardly in his line—brushes up his arithmetic, though still on the old lines, and becomes fairly proficient in book-keeping and shorthand. A smaller number go in for French and German, and

only a very few perfect themselves to the extent of acquiring any technical understanding of their business—of the chemistry, production, manufacture of the raw material—Waarenkunde, as the Germans call it; of the laws of trade, shipping regulations, commercial and international law; or even such a local knowledge of geography, men, and manners, as would enable the head of a business firm to supply his customers with just the very thing they want, to anticipate that want, or, if need be, create it. In this, as in higher things, "Strait is the gate and narrow is the way, and few there be who find it;" and for the great majority the rude shock of disillusionment, and the consequent shattering of the idol of self-esteem, has a paralysing effect, so that these young men are content to sink into the ranks of that class—increasingly large, increasingly hopeless—the mere clerk or human penholder. We say increasingly hopeless, for the market value of a man depends upon the degree to which he makes himself indispensable. "What do ye *more than others*," is the law of survival.

To return to our subject in its first aspect. A great deal, almost everything, has to be done for our commercial evening classes in the way of *co-ordination*, and we need only mention here the laudable attempts in this direction made by the Society of Arts, the London Chamber of Commerce, and in technology by the City and Guilds of London Institute. The first of these bodies, the Society of Arts, offers certificates, prizes, and medals, with a few scholarships, for examinations in commercial subjects, and these certificates have for over a quarter of a century been recognised as the high-water mark of excellence in their respective subjects.

The London Chamber of Commerce has also set a good example in the way of co-ordinating commercial classes, and upwards of 300 London firms, members of the Chamber, have consented to give a preference, *ceteris paribus*, in filling vacancies in their establishment to applicants presenting the commercial certificate.

The School Board of Glasgow some years ago made a similar attempt by instituting a four-years' course in commerce in the Evening Continuation Schools, and although that scheme is rather fanciful and exists only on paper, why should not a practical scheme be tabulated and countenanced in similar fashion by the Glasgow Chamber of Commerce? Following the lead of France, such a scheme should be drawn up by the business men of the city, not by the School Board alone, nor by the teachers,

for these latter bodies have been so long accustomed to move along the academic lines of the Code and the Leaving Certificate that it requires a strong will to wrench oneself out of the groove.

See what is being done this winter in Liverpool [*Herald*, 4th October, 1898]:—

"A new departure of considerable interest, I learn, has been taken by the Liverpool City Council for the organisation of classes of an advanced character in subjects of commercial importance. A school, which for the present contemplates instructing evening students only, has been established under the management of a joint-committee, consisting of representatives of the Technical Education Committee of the City Council, the Liverpool Chamber of Commerce, and the local University College, and a carefully devised curriculum drawn up. The main object has been to provide a training of the most practical and business-like character, well up to date, and capable of direct application to the commerce and trade of the city. It is not intended that the classes shall deal with the more elementary subjects of commercial education, such as shorthand, book-keeping, commercial arithmetic, and so on, but that the classes shall be special, and taught by those who have themselves had practical experience. The time table includes modern languages (French, German, Spanish), commercial practice, advanced commercial arithmetic and accounts, economics of commerce, and commercial geography. The technical instruction of clerks in commercial houses, banks, insurance offices, warehouses, and shipping offices; correspondents, cashiers, commission agents, managers, &c., is contemplated; and it is believed that the enterprise will be successful in its aim by fitting young men to take positions of trust in commercial life, and thus enabling them to face the competition for which the superior commercial education given in some of the continental schools is to some extent at least responsible. The experiment will be watched with great interest, and no doubt, if it is successful, similar schools will be started in other large cities in the country."

Having now stated the problem and indicated how it may be met in its first aspect—that of co-ordinated evening classes—let us now see how continental nations are attempting to solve it in all aspects. Many years have passed since the phrase, "Made in Germany," passed from the sphere of ridicule and became a word of fear. The Germans themselves are never tired of

ascribing their commercial and even their military supremacy to their magnificent school system, and, as all other civilised nations have copied the German school system with local modifications, to Germany let us turn.

In Prussia education is compulsory from 6 to 14, not 5 to 13 as with us, and the later year tells in favour of the German; but, besides the elementary schools, Prussia is well provided with secondary schools of these types, covering the ages from 9 to 18. The Germans have not fallen into the mistake of building a secondary department upon an elementary school; secondary education is with them a thing *sui generis*. Entrants to these secondary schools may attend an elementary school till the age of 9 is reached, but most secondary schools have, like our own High School, a preparatory department of three years, so that a boy may have his whole course completed under one roof. The Gymnasium is the time-honoured classical school, with a nine-years' course, and it alone confers full privileges at a German university. It alone admits to the study of philology, history, classical philology, law, theology, economic science, and medicine, *i.e.*, every doctor, lawyer, graduate teacher, and minister in Prussia has gone through the nine-years' course.

The second type of school is the Realgymnasium, similar to the above, with Latin, but no Greek; then comes the Oberrealschule, with neither Latin nor Greek. The Realgymnasium has two advantages over the purely modern Realschule, viz., it admits to the higher military and naval science colleges, and to the modern languages course at a university.

Besides these nine-year schools, there are other secondary schools with a six-years' course, similar in scope:—the Progymnasium, the Realprogymnasium, and the Höherebürgerschulen, or, as they are now called, Realschulen. Boys who have completed six years in any of these secondary schools, and passed the leaving certificate examination, are excused one of the two years' compulsory military service enjoined by the German Government, and, moreover, enjoy a higher status while serving. Further, the best firms insist upon this leaving certificate as a recommendation to candidates for vacancies, and the doors of the 22 German universities, the military colleges, and the higher technical schools for science or commerce are absolutely closed except to holders of the same certificate. The subjoined time-table indicates sufficiently the curriculum of the Realschulen and Oberrealschulen:—

TIME TABLE FOR REALGYMNASIA (Modern Schools with Latin).

—	VI.	V.	IV.	IIIB.	IIIA.	IIB.	IIA.	IB.	IA.	Total.
Religion,	3	2	2	2	2	2	2	2	2	19
German and Historical Narration,	3 + 1 = 4	2 + 1 = 3	3	3	3	3	3	3	3	28
Latin,	8	8	7	4	4	3	3	3	3	43
French,	...	...	5	5	5	4	4	4	4	31
English,	...	...	...	3	3	3	3	3	3	18
History and Geography,	2	2	2 + 2	2 + 2	2 + 2	2 + 1	3	3	3	28
Arithmetic and Algebra,	4	4	4	5	5	5	5	5	5	42
Natural History,	2	2	2	2	2	2	...	...	...	12
Physics,	...	...	...	...	...	3	3	3	3	12
Chemistry and Mineralogy,	...	...	...	...	...	...	2	2	2	6
Writing,	2	2	...	...	...	...	...	...	...	4
Drawing,	...	2	2	2	2	2	2	2	2	16
TOTAL,	25	25	29	30	30	30	30	30	30	259

REMARKS.

To these hours are added, as (generally) obligatory, drilling and gymnastics three hours a week for each class from VI. to IA., and singing two hours a week in VI. and V.

The brackets imply that these subjects are to be entrusted as much as possible to the same teacher.

By combining the natural science subjects in the hands of one teacher, it is intended to render it possible occasionally to devote to one of them the hours assigned to both.

TIME TABLE FOR OBERREALSCHULEN (Modern Schools without Latin).

—	VI.	V.	IV.	IIIB.	IIIA.	IIB.	IIA.	IB.	IA.	Total.
Religion,	3	2	2	2	2	2	2	2	2	19
German and Historical Narration,	4 + 1 = 5	3 + 1 = 4	4	3	3	3	4	4	4	34
French,	6	6	6	6	6	5	4	4	4	47
English,	...	...	...	5	4	4	4	4	4	25
History and Geography,	2	2	2 + 2	2 + 2	2 + 2	2 + 1	3	3	3	28
Arithmetic and Algebra,	5	5	6	6	5	5	5	5	5	47
Natural History,	2	2	2	2	2	2	...	...	...	12
Physics,	...	...	...	...	2	2	3	3	3	13
Chemistry and Mineralogy,	...	...	...	...	...	2	3	3	3	11
Writing,	2	2	2	...	...	...	...	...	...	6
Freehand Drawing,	...	2	2	2	2	2	2	2	2	16
TOTAL,	25	25	28	30	30	30	30	30	30	258

REMARKS.

The classes begin with sexta, the lowest, and after six years, indicated by the double line, the leaving certificate examination may be taken, though many pupils, especially in the classical schools, go through the full nine-years' course. There are no examinations at the end of each term; they may be held at the end of each year, but, as a rule, the only formal examinations are after nine years and six years, the latter to obtain the military certificate.

Although science is an obligatory subject in all German secondary schools, it does not bulk to so large an extent as in the "Schools of Science" of our own Science and Art Department, or even in the recently constituted "Higher-grade Science Schools" of the Scotch Education Department. Germany possesses higher technical schools for science as well as for commerce, and these are open only to holders of the leaving certificate.

On examining the time table of such a school, it will be seen that the subjects are few compared with ours. To judge of their thoroughness, let us listen to a lesson as reported last December by Mr. Sadler to the Education Department:—

"ENGLISH LESSON IN UNTERSECUNDA OF THE MUSTERSCHULE IN FRANKFURT.

"There were about twenty-five boys present. *They had begun English last Easter** in accordance with the new scheme, which up to the present has only reached this form, having been introduced year by year in successive classes, starting naturally from the bottom. In calculating the exact time these boys had been learning English, allowance must be made for the intervening summer holidays. The first object in the modern language teaching in this school is, as far as possible, to give the pupil the impression that during the lesson he is in England or France, as the case may be. For instance, on the walls of the room in which this lesson was held were photographs of places of importance and interest in England, coloured cartoons representing the chief events of English history, a map of the British Isles, and a large plan of London.

"It will be seen from the account of the following lessons how important a part the equipment of the class-room plays in the successful carrying out of the method. To mention only one detail, the desks were so arranged and of such a design that a boy could immediately be sent to any part of the room without disturbing his neighbour or interrupting the lesson. In short, the whole machinery moved with the minimum of friction. When one considers the amount of work done in the space of *fifty minutes* in this school, it is obvious that the least hitch in the proceedings would represent an enormous loss in the total output.

* This was written in December.

"The whole lesson was carried on in English. Once or twice, however, the teacher, to save time, explained in German a command which a boy could not understand. On entering the room the master asked for the Jubilee numbers of *The Graphic* and *Illustrated London News* from the two boys whose turn it had been to take them home the day before. This led to a conversation about the Queen and English notabilities, English schools and school life. The master described a game of cricket, and, to explain the word "toss," called up a boy to "toss" with him for innings. All mistakes in pronunciation were immediately corrected, the boys indicating the right sounds on the table of phonetic symbols (Vietor's system) hanging on the wall facing the class. Two boys then went to different boards to write in their own words an account of certain parts of the foregoing conversation. The lesson meanwhile proceeded, a boy being sent to the plan of London to point out and describe various places of interest, such as Hyde Park, St. Paul's, Trafalgar Square, &c. It struck me that many boys in provincial English schools would not have known as much about their own capital as these young Germans. Trafalgar Square suggested a passage in their Readers on Nelson and the Battle of Trafalgar, and various boys gave an account of this event. The class then corrected what the two above-mentioned boys had written on the boards; verbs occurring were conjugated in their sentences by the class in chorus; also thus: *I go, you went, he will go, we should go,* &c.* The boys then recited various poems representative of English life and character. Questions were asked as to the authors. Verses were written on the boards in the manner already described in the account of the lesson in the Bockenheimer Realschule. The class corrected these. The *k* having been omitted in the word *knee,* the master asked for another example of a word beginning with *kn;* the boys were immediately ready with *knavish,* and quoted 'Frustrate their knavish tricks!' This suggested the recitation of our English National Anthem.

"Finally, the master recited and explained to the class a new verse of poetry. Every expression presenting difficulty to the pupils was explained by reference to some former occasion on which they had met with it, or translated by English words already familiar to the boys."

* Or thus:—I go—did you go? he has not gone; hadn't she gone? we shall go; will you have gone? they wouldn't go; wouldn't they have gone?

These Oberreal and Realschulen have supplied Germany with a system of non-classical secondary schools which, in point of laying a suitable foundation of general knowledge for those intending to devote themselves to business life, is probably without a rival in the world. No other nation has so systematically built up its fabric of intermediate day schools. The process has been a long one; its directors have been satisfied with nothing short of a very high level of intellectual attainment; and the commercial results of this rudely-diffused liberal education are only just beginning to show themselves.

Prussia alone is turning out youths thus trained at the rate of thousands a year. Experts of our Education Department are convinced that the world has only begun to taste the effects of the *first-class, non-classical, secondary education* now given all over industrial Germany. The commercial advance of the German empire, so striking to any visitor to that country, is due to a combination of causes. But one of these causes is the extreme intellectual efficiency of the secondary schools.

To mention but one of many dangers arising from this direction, let me read you an extract from the London *Daily Mail* of this month:—

"A London wool merchant the other day said to the writer:—'I have always done a very large export business with France. Some time ago I advertised for a French correspondent. Among the numerous replies there was only one from an Englishman, and he knew about as much French as myself, which would scarcely carry me from Calais to Paris. I was forced to employ an Austrian, who spoke not only perfect French, but German and English quite as well. He was invaluable while he stayed, but he left at the end of a year. He took a list of all my customers with him, and the consequence is that a house in which he now works in Austria has deprived me of one-third of my French trade.'"

Glasgow merchants assure me that they too have suffered at the hands of "volunteers" from Belgium, Germany, even far Japan. They come to learn English, and to attain that end they will work for a nominal salary, as the native clerk knows only too well. Many of them belong to families in fairly good circumstances, and such wages as they get here are but pocket-money; in other respects the only people who benefit by them are the keepers of the boarding-houses which they frequent.

Not content with these modern schools, the Germans have for

some years been agitating for a higher commercial school of a more specialised or technical type, following the lead of Antwerp, and in 1898 there was established at Leipzig the first of a series of Handelshochschulen, or higher schools of commerce. Professor Dr. Raydt, the principal of the new establishment, a man of long experience in Continuation and Realschulen, is evidently convinced that a great deal might be done which cannot be covered or even attempted in even the Oberrealschule. Says he:—If a higher school of commerce is worth having at all, it ought to be of academic rank, equipped like a sort of university college, and staffed by men of high intellectual attainment and position. Whether such an institute should be made an organic part of a university is a very difficult question, and though the University of Leipzig answers that question in the negative, three of its professors have seats in the senate of the Handelshochschule.

This Higher School of Commerce at Liepzig will provide a two-years' course, and will be open to the following classes of students:—

1. Those who have passed the leaving examination held at the completion of the nine-years' course of study in a secondary school.
2. Persons engaged in trade who have completed with success a six-years' course in a secondary school, and have thus gained the military certificate for one year's service.
3. Students from German training colleges for elementary school-teachers, who have passed the second professional examination for teachers in elementary schools.
4. Foreigners (over 20 years of age) who show evidence of possessing the required standard of educational ability.

It is not expected that a boy shall pass from the Oberrealschule direct to the Handelschule. The intention is that, after passing through the secondary school, a boy should serve two years as an apprentice (Lehrling) and then one year as a clerk, *i.e.*, three years in all of practical work before taking up the higher course.

There is no entrance examination for the Commercial High School.

The teaching department consists of two parts:—I., Lectures; and II., Practical Teaching.

As to lectures (I.), the following courses are given:—

1. Theoretical and practical national political economy (duration two half-years, and five hours a week).

This includes the following subjects :—coinage, weights and measures, banking and stock exchange businesses, commercial politics, commercial statistics, credits, transport, and insurance.

2. Science of finances (duration one half-year, and four hours a week).

This includes the subjects of taxation, duties, and public credit.

3. Knowledge of substances of goods and technology.

This subject can be read up and combined with a practical inspection of goods in leading local firms.

4. Commercial geography (duration one half-year, and two hours a week).

[NOTE.—A good elementary general knowledge is assumed. Special importance will be given to the leading commercial movements of the day.]

5. Economic history, with special reference to commercial history (duration one half-year, and one hour per week).

6. General law knowledge (duration one half-year, and two hours a week).

7. Commercial law, law of exchanges, and maritime law, combined with practice in commercial law (duration one half-year, and five hours a week).

8. Law of bankruptcy (duration one half-year, and two hours a week).

9. Laws relating to industry, workmen's insurance, and ordinary insurance (duration one half-year, and two hours a week).

10. International law (duration one half-year, and two hours a week).

11. Colonial policy (duration one half-year, and two hours a week).

12. Special lectures for teachers of commercial subjects.

13. Other general lectures.

Under this head are included the great variety of lectures at the Leipzig University which can be followed. But the Director of Studies will determine which are suitable for the course being followed by any particular student.

As to practical teaching (II.), the following courses are given :—

1. Commercial and statistical calculations, &c. (duration two half-years, and six hours a week).

This includes compound interest, dividends, annuities, the

manner of paying off loans, method of reckoning employed in insurance companies, &c.

2. Book-keeping, German commercial correspondence, and other office work (duration two half-years, and six hours weekly).

In the second year practical commercial exercises are given. These are only for persons who have not previously had a practical commercial education.

It is thought possible that in the second year a few hours a day might be given, in suitable local firms, to a study of the business samples; or that a department of samples might be created for this special study.

3. Technical and chemical practical teaching (duration two half-years, and two hours a week).

4. French commercial correspondence (duration two half-years, and two hours a week).

5. English commercial correspondence (duration two half-years, and two hours a week).

The teaching of French and English will be of the same class as that given in a Realschule under the Prussian teaching plan of 1891.

6. Italian (duration four half-years, and two hours a week).

7. Spanish (duration four half-years, and two hours a week).

8. Russian (duration four half-years, and three hours a week).

9. Shorthand (duration two half-years, and one hour a week).

10. Practice on the type-writer.

The courses 6 to 10 will be started when a sufficient number of students have entered themselves for them.

Courses for other languages will also be instituted if the necessity arises.

The students at the Commercial High School have the right, when they have regularly attended the lectures and practical teaching classes, to take part in the closing examination. They will then receive a diploma, with attestation, for each branch of study.

It has not yet been settled how many, and which, branches are absolutely necessary in order to gain a diploma.

For the final examination a special Board will be appointed.

An attempt will be made to create a State Examination Board so as to give the diplomas, &c., a wider value.

For the "lecture visitors" ("Hörer") a certificate of attendance can be given, if desired.

For those students who intend to become teachers in the commercial schools, a special seminary will be created.

As members to this seminary there can be admitted:—

1. Students at the Leipzig University, and other "academically" educated candidates for commercial teacherships.

2. Teachers from seminaries.

3. Commercial persons who wish to become teachers of commercial subjects, on the condition that they have obtained the privilege of only one year's military service, and have been engaged in business for at least six years.

Special diplomas will be granted for this seminary.

The Germans, however, have not confined commercial training to those who have taken the "modern" side in their secondary schools. They fully recognise the value of a classical course of education for those who can spare the necessary time, and for these classical students they offer a special course in commercial studies. Such courses, of *one year*, are obtainable in Leipzig and in the Mercantile Academy of Vienna, as follows:—

No. 7.—LEIPZIG—TECHNICAL MERCANTILE COURSE.

HIGHER COURSE—*One Year.*

	Hours.
English, ...	3
,, Commercial Correspondence, ...	2
French, ...	3
,, Commercial Correspondence, ...	2
Commercial Law, ...	2
Book-keeping, ...	6
Commercial Correspondence in German, ...	2
Political Economy,...	3
Waarenkunde, ...	2
Mercantile Arithmetic, ...	3
,, History, ...	2
	30 weekly.

Entrants must have obtained military certificate, age (say) 17.

No. 8.—VIENNA—MERCANTILE ACADEMY.

One Year's Course.

(*a*) OBLIGATORY SUBJECTS.

	Hours.
Political Economy,...	2
Commercial Law and Law of Bills of Exchange, ...	3
,, Geography and Statistics, ...	3
Book-keeping and Correspondence, ...	7
Mercantile and Political Arithmetic, ...	4
"Usance" and Casting of Produce, ...	2
Waarenkunde, ...	2
Theory of Life and Fire Insurance, ...	1
	24

(*b*) ONE OF THE FOLLOWING MODERN LANGUAGES OBLIGATORY.

	Hours.
French taught in German, ...	3
,, ,, French,...	3
English, ...	3
Italian, ...	3

(*c*) NON-OBLIGATORY SUBJECTS.

	Hours.
Course on Customs and Duties on Taxation, ...	2
Caligraphy, ...	2
Practical Work in Laboratory in Waarenkunde, ...	2

Entrants must have completed full course at Gymnasium or Realgymnasium and obtained the leaving certificate.

So much for the Fatherland.

> To kinder skies, where gentler manners reign,
> I turn, and *France* displays her bright domain.

For our purposes the history of education in France begins with the Act of 1886, which almost did more in France for the organisation of popular education than the 1870 Act did in England. This Act, in its first article, includes within its scope not only primary, but higher primary and professional education.

We have to deal with the *école primaire supérieure* and the *cours complementaire.* To these no scholar is admitted unless he possesses the certificate of elementary studies, and has passed a year in the highest standard. The minimum age is 12, and in default of the elementary school certificate, entrance is by an equivalent examination open to those who are over 13 only, and are thus exempt from compulsory school attendance. When there is a deficiency of places, a competitive examination is held by a commission. The course extends over three years, is distinctly general, specialised study being prohibited before the fourth year, and *there are no fees,* thus putting the higher class primary schools within reach of the great mass of the people, as well as keeping them under Government control. These schools are further assisted by the establishment of scholarships from communal, departmental, and State funds, including some excellent "foreign travel scholarships" of 100 francs a month, tenable for a year, with the possibility of extension. By the Act of 1886, and the explanatory *Décret* of 1887, the curriculum was declared to be a *résumé* of the work done in the elementary schools, the

subjects being dealt with more deeply, and also in the following subjects:—

Applied arithmetic.
Elements of *practical* algebraical and geometrical work.
Rules of ordinary accounts and book-keeping.
Elementary natural and physical science as applied to agriculture, manufacture, and hygiene.
Geometrical, model, and ornamental drawing.
The elements of common law and political economy.
Elementary French history and literature.
The principal epochs of general history, more especially those of modern times.
Industrial and commercial history.
Modern languages.
Working in wood and metal for boys.
Needlework, cutting-out, and dressmaking for girls.

Nine hours a week are given to general subjects, nine to mathematics and science, four to modern languages, three to drawing, and four to manual work. To ensure that every pupil is in his proper place, Article 30 lays down that every pupil, *no matter whence he comes*, must on entering the *école primaire supérieure* undergo an examination before the headmaster, a master on the literary side, and a master on the science side, and on this examination will depend the particular "year" or "course" in which he will be placed. Under the new French Code of 1893 the curriculum has been extended to four years, and each school may be divided into sections, viz., general, commercial, industrial, and agricultural. Of course, only the largest schools maintain all these sections, but each school must declare the section or sections which it maintains, and prepare its time table accordingly. All the scholars pass their first year together in one common or general section, after which each chooses the section he will follow for the remaining three years of his course. In Paris there is one simultaneous public examination for all the higher primary schools; the successful candidates are ranged in order of merit, and are then called upon in that order to choose the school to which they prefer to go, according to the number of vacancies available in each. There is also an examination at the end of each quarter, of which the results are sent to the parents; and in connection with this I may point out that one of the most important duties of the Director is to advise parents for

and against the continuance of the children's attendance, as well as in choice of the particular section. In the former matter his opinion is, by statute, final; and in the latter concern it is very generally paramount. *There is no average attendance grant to tempt the managers or teachers to retain scholars who are getting no adequate benefit from the school.* The school is divided into "years" of study, and promotion into each division or "year" takes place only once in twelve months. Those who fail to pass the very searching *examen de passage* have either to leave or to *redoubler*, *i.e.*, to stay another year in their present division. This occurs in a great many cases, especially at the end of the first year.

Having passed the entrance examination, the pupil enters upon his first year's course, which is the same for all comers, no specialisation being permitted till the beginning of the second year.

The sections are four in number—general, commercial, industrial, and agricultural—but there are six subjects which extend through all the sections, being considered to represent the basis of all instruction—thus, morals, writing, history, civic instruction, gymnastics, and singing are taught one hour a week each to both sexes, in all three years, and in all the sections. Also, boys have two hours and girls one hour for physics and chemistry in all three years in all sections. Elementary notions of common law and political economy are taught one hour a week in the third year of each section, both to boys and girls. Each section has, of course, its characteristics. Thus the *general* section is marked by the large amount of time given to French language and literature, three to five hours a week; the *industrial* section is characterised by more mathematics and technical drawing, and also by its *travaux manuels*, which take six hours a week. In the *commercial* section, manual instruction also figures to the extent of two hours a week, but book-keeping gets three hours, and languages four, and there is an additional hour given to commercial geography. The *agricultural* section has no modern languages, very little drawing, but is strong in the natural sciences and manual occupations bearing upon soil culture.

Appended are the time tables of the *Higher Primary Schools* for boys and girls respectively, with, by way of comparison, the time table of a Modern Secondary School. It will at once be seen that the former curriculum is very scrappy, there are far too many

items, and many of the "fancy" subjects get time which can ill be spared from such an essential subject as arithmetic.

TIME TABLE OF FRENCH HIGHER PRIMARY SCHOOLS.

Boys.

SUBJECTS.	NUMBER OF HOURS PER WEEK TO EACH SUBJECT.								
	General Knowledge.			Industrial Section.		Commercial Section.		Agricultural Section.	
	1st Year.	2nd Year.	3rd Year.	2nd Year.	3rd Year.	2nd Year.	3rd Year.	2nd Year.	3rd Year.
Morals,	1	1	1	1	1	1	1	1	1
French,	5	5	4	2	2	2	2	2	2
Writing,	1	1	1	1	1	1	1	1	1
History and Citizenship,	1	1	2	1	1	1	1	1	1
Geography,	1	1	1	1	1	2	2	1	1
Modern Languages,	3	3	2	...	...	4	4	...	...
Mathematics,	4	3	3	3	3	2	2	2	2
Accounting and Book-keeping,	...	1	1	2	2	3	3	1	1
Physics and Chemistry,	2	2	2	2	2	2	2	2	2
Natural History and Hygiene,	1	1	1	1	1	1	1	2	2
Agriculture,	1	1	1	...	...	...	...	3	3
Common Law and Political Economy,	...	...	1	...	1	...	1	...	1
Drawing and Modelling,	3	3	3	4½	4½	1½	1½	1½	1½
Manual Instruction,	4	4	4	6	6	2	2	6	6
Gymnastics,	2	2	2	2	2	2	2	2	2
Singing,	1	1	1	1	1	1	1	1	1
Spare hours,	...	...	...	2½	1½	4½	3½	3½	2½
TOTALS,	30	30	30	30	30	30	30	30	30

TIME TABLE OF FRENCH PRIMARY SCHOOLS.

Girls.

SUBJECTS.	NUMBER OF HOURS PER WEEK TO EACH SUBJECT.						
	General Knowledge.			Commercial Section.		Industrial Section.	
	1st Year.	2nd Year.	3rd Year.	1st Year.	2nd Year.	1st Year.	2nd Year.
Morals,	1	1	1	1	1	1	1
French,	5	5	4	2	2	2	2
Writing,	1	1	1	1	1	1	1
History and Citizenship,	1	1	1	1	1	1	1
Geography,	1	1	1	2	2	1	1
Modern Languages,	3	3	3	4	4	3	3
Mathematics,	3	2	2	2	2	2	2
Accounting and Book-keeping,	...	1	1	3	3	1	1
Physics and Chemistry,	1	1	1	1	1	1	1
Natural History and Hygiene,	1	1	1	1	1	1	1
Horticulture,	1	1	1	1	...	...	...
Common Law and Political Economy,	...	...	1	...	1	...	1
Drawing and Modelling,	3	3	3	1½	1½	4½	4½
Manual Instruction,	5	5	4	3	3	6	6
Gymnastics,	2	2	2	2	2	2	2
Singing,	1	1	1	1	1	1	1
TOTALS,	29	29	28	26½	26½	27½	28½

By way of comparison, the following time table is given of a French Secondary School, Modern Side :—

SUBJECTS.	Number of Hours per Week in each Subject.						
	Division de Grammaire.			Division Supérieure.			
	VI.	V.	IV.	III.	II.	I. Lettres.	I. Science.
French,	6	6	4½	4½	4½	4½	...
German or English,	6	4	4	3	3	1*	1*
Other Modern Languages, (Preferably English or German.)	...	4	6	3	3	1*	1*
History,	1½	1½	1½	1½	1½	1½	1½
Geography,	1½	1½	1	1	1	1½	1½
Arithmetic,	2½	2½	...	...	...	...	...
Mathematics,	...	...	3	4½	4½	...	6
Science,	1½†	1½†	...	3‡	4½‡	...	4½‡ 1½†
Drawing,	3	3	3	3	3	1½*	3
Writing,	1	1	1	...	...	...	...
Morale Pratique,	...	...	1	...	...	...	...
Philosophy,	...	...	...	...	...	6	3
Elements of Law and Political Economy,	...	...	...	...	...	2	2
Accounting,	...	...	...	...	...	1*	1
History of Civilisation and of Art,	...	...	...	...	..	3	...
Totals,	23	25	25	23½	25	24½	26

* Optional. † Natural History. ‡ Physics and Chemistry.

Following the lead of Germany in its Oberrealschulen, France has established at the present time *eleven* Higher Schools of

Commerce recognised by the State. These have a two-years' course, and attendance at them carries two years' remission from military service, but only to those students who gain not less than 65 per cent. of marks over their whole course, *i.e.*, to about four-fifths of the whole. At first supported by a small Government grant (£400), they have now to draw on their own resources, but the French Government gives an annual grant of £1,640 for *travelling scholarships.* These are tenable for two or three years by young men who have obtained the diploma of a recognised Higher School of Commerce, and they are of two classes—first, for youths from 16 to 18 years of age, tenable for two years, value £160 and £120 respectively; second, for young men of 26 years of age and upwards who have completed their studies at a Higher School of Commerce. These are tenable for two years, but may be renewed for a third. Their value, if held in Europe, Algeria, or Tunis, is £100, £80, £80; if in any other country, £150, £120, £80, for the three years respectively.

In the case of the Paris High School of Commerce the interest shown by the commercial world in this undertaking is shown by the wealth of provision which the Paris Chamber of Commerce has made, comprising, besides the usual class-room accommodation, a fine museum of commercial products, an ample and beautiful library, a laboratory, two large lecture-theatres, a number of lecture-rooms, dining-rooms, several recreation-rooms, as well as the dormitories, sanatorium, &c., which belong to the residential section, for this school has boarders as well as day students.

In the foregoing pages mention has been repeatedly made of that crown of commercial education, the *Institute of Commerce at Antwerp*, a college which has served as a model to Leipzig even. For an outline of this unique establishment, commercial men and educationists are referred to a consular report, No. 477, and for its details to the admirable and extensive report of Mr. Sadler to the Education Department, published in December last. The following short summary will serve to convey an outline of the institution and its aims:—

The *Institut Supérieur de Commerce* at Antwerp is a commercial university, intended to train merchants of the highest type, and especially those from whom Belgium draws its consuls. It is supported and inspected by the State, the Central Government defraying three-quarters of the cost and the City of Antwerp the

rest, £1,800 and £600 respectively. Besides a rector, the institute possesses a staff of 14 professors—all civil servants, by the way—and two *répétiteurs*, or assistants, while the students numbered last April, 255, fully one-third being foreigners.

The usual course extends over two years, but an extra year has been added, the work for which is optional, though supplementary. The fees are £10 and £12 in the first and second years respectively, and the lectures are given in French.

The first year's course includes the following subjects:—the routine of a merchant's office, including advanced commercial arithmetic, rates of exchange, average and marine assurance, bills of lading, charter-parties, calculations of values of foreign weights and measures, and commercial correspondence in various languages. Along with this the history of commercial products, political economy and statistics, commercial and industrial geography, the elements of commercial law, together with the following modern languages:—German, English, Dutch, and either Spanish, Italian, or Russian.

The second year's course carries forward the instruction of these subjects to a higher stage, laying special stress on commercial law and on the study of tariffs, and adding a weekly practical discourse designed to acquaint the students with the main regulating conditions of modern shipbuilding.

The students may enrol for separate classes, but the majority take the full course. An entrance examination is set, comprising French composition, translation from French into English and German, physical geography, outlines of universal history (a special period being prescribed), commercial arithmetic and book-keeping, the elements of physics and chemistry, commercial law and political economy. The usual age on entering is not less than 17.

Throughout the year oral and written examinations are held, the marks from which are taken into account with the *examen de passage* at the end of the year, for the authorities reckon it unwise to place a student according to the result of a single examination. At the end of the second year comes the very severe "Final," conducted by examiners nominated by the City of Antwerp. Last year this Board consisted of a retired Consul-General, who was specially chosen to test the fitness of the candidates for consular appointments; one of the most eminent foreign traders in Antwerp, for examination in business knowledge;

another eminent merchant, a recognised authority on economics; a professor from Brussels University; and three professors of the institute itself. Two-thirds of the candidates failed, so that the coveted diploma of "*Licencié en Sciences Commerciale*" is highly valued. This value is still further enhanced by the fact that such a diploma renders its holder eligible for the valuable travelling scholarships offered by the Belgian Government. These are worth from £200 to £250 a year, and are tenable for three years, a system which has been imitated by France.

The whole work of the institute is intensely practical. Its class examinations are purposely designed to defeat mere cramming and plodding through books, and one-half of the Board of Examiners are practical business men of the highest standing. This trend is further evidenced by the fact that the institute is not under the Education Department, but under the Board of Trade, its managers being evidently of opinion that they will thus be kept more in touch with the actual commercial world.

As a sample of the teaching, I may quote Mr. Sadler's description of an English lesson:—

"Sixty-eight students were present at the lecture. About ten minutes after it began, a *répétiteur* came round and marked the attendances. The professor began in French. He said he would read a passage from the commercial intelligence in an English newspaper. Producing a cutting from the *Times*, he read aloud that 'a large contract for the supply of 20,000 tons of best colliery-screened Monmouthshire steam coal had recently been placed at ———, and that great interest had been excited in the trade at the size of the order.' He proceeded to read the market quotations for different kinds of coal. A student was then called upon to translate into French the dictated passage, which had been taken down in English. The whole lesson, which formed part of the first year's course, was an admirable disquisition on the meaning of a large number of technical terms used in English trade, and on their equivalents in French. After thoroughly working through such a course, a young Belgian or German would have much less difficulty in understanding the commercial intelligence in an English newspaper than if he had to rely on the best of dictionaries."

By royal decree of 1896 the universities of Ghent and Liège

have been authorised to grant the degree of *Licencié en Sciences Commerciales* after a similar course, but in these universities more attention is given to theoretical subjects, such as law and political economy, and less to purely commercial subjects. Accordingly, these courses are held to be more suitable for those who desire to become commercial lawyers, or to enter the consular service, rather than for merchants.

To give this question a practical turn—How far are we in Scotland prepared to go at present in the direction of systematic commercial education? Development may proceed along the three lines indicated at the outset:—co-ordination of evening continuation classes; creation of Higher Grade Schools of Commerce in imitation of the German Handelshochschulen—a step contemplated by the 1899 code; and, finally, the establishment in Glasgow or elsewhere of a high-class institution on the lines of the Antwerp Institut de Commerce.

Little need be said on the first head. It should not be difficult for, say, the School Board, the Chamber of Commerce, and the Directors of the Athenæum to devise a two-years' course in commercial subjects, such as English, arithmetic, book-keeping, shorthand, commercial geography, modern languages, and ware-lore (Waarenkunde), with physical geography and the elements of political economy. An examination in these subjects upon the lines and up to the standard of the Society of Arts would entitle the successful candidate to a diploma; and it is not too much to ask the Glasgow merchants to follow the example of their brethren in London and Liverpool, and to say that in filling vacancies preference shall be given, *ceteris paribus*, to holders of these certificates.

Of more immediate and lasting consequence is the institution of Higher Grade Schools of Commerce, as foreshadowed, not dimly, in the Scotch Code of 1899, Articles 139-140. Provision is there made for the establishment of Higher Grade Commercial as well as Science Schools or Departments, and where these exist side by side the courses for the first year may be identical.

JOHN STREET PUBLIC SCHOOL, BRIDGETON, AS A HIGHER GRADE SCIENCE AND COMMERCIAL SCHOOL.

TIME TABLE.

SUBJECTS.	1st Year.	2nd Year.		3rd Year.		4th Year.	
	General.	Sc.	Com.	Sc.	Com.	Sc.	Com.
English,	3	3	3	3	3	3	3
History,	2	2	2	2	2	2	2
Geography,	2	2	2	2	2	2	2
Mathematics and Arithmetic,	Boys 6 Girls 4	6 4	6 4	6 or 7 4 or 5	5 3	6 or 7 4 or 5	5 3
Science,	4	5 or 6	3	8	3	8	4 2
Manual Instruction,	Boys 3 Girls 5	3 5	... 3 or 4	... 2	... 3	... 2	... 4
Drawing,	3	3	2 1 or 0	3	2 0	3 or 2	...
Music and Drill,	1*	1 or 0†	...	1 or 0†	...	1 or 0†	...
French,	5	5	5	5	5	5	5‡
German,	...	...	3	...	5	...	5
Writing and Book-keeping,	2	...	2	...	2	...	2
Shorthand and Typewriting,	...	...	2	...	2	...	2
Total Hours weekly,	30	30	30	30	30	...	30

* Off Mathematical Drawing or Book-keeping.

† Preferably 0, giving another hour to Mathematics or Science.

‡ Pupils who have passed in French may begin Spanish or Italian.

The details of such a course would work out something like this:—

English.—First year.—Spelling to be thoroughly mastered. *Grammar* thoroughly taught, with special stress on analysis.

Paraphrasing, both oral and written. No English classic to be used, but rather a good reader, *e.g.*, the Temple Reader, presenting choice extracts from the best modern writers.

Second year.—Fluency of composition to be aimed at here, both in speech and writing. Analysis and paraphrasing. History and structure of the language. Commencement with commercial vocabulary.

Third and fourth years.—Commercial reading, newspapers, technical phrases of all sorts, shipping and trade news from trade journals and the daily papers. This may be combined with "Ware-lore" (Waarenkunde), so as to extend the vocabulary. Composition at this stage to include Précis-writing—indexing, and other branches of "Civil Service" competition work.

History and Citizenship.—In the first year we prefer to take the Stuart period, as giving a fair basis of constitutional history, and leading easily to a discussion of the present political system, a subject of which even an intelligent scholar has a great deal to learn.

The second year deals with the rise of the empire, and must be co-ordinated with the geography course at all points.

For the third and fourth years the scholar will study modern history, say, since 1832, as treated in such works as Molesworth's "History of England since the Reform Bill," "M'Carthy's Epochs of Reform," etc., and treating of such political subjects as the franchise, corn laws, free trade, the bounty systems, etc., etc.

While European politics will enter into all courses, they will form a special basis of the fourth year's course. Here the several countries will be studied politically rather than historically, the republican systems of the United States, France, and Switzerland, the federal empire of Germany, etc., giving the necessary basis of object lessons.

Geography.—In the *first year* the *British Islands*, with special reference to their geology—for mines, &c., railways, and trade routes; fisheries; industrial geography; distribution of population; the racial element; healthy and unhealthy districts; distribution of crime, &c.

Second year.—The British Empire and the United States, treated historically and commercially.

Third year.—Europe in detail; Europe in Africa and Asia, on the lines of the Society of Arts syllabus.

Fourth year.—Asia, Africa, Polynesia.

The close connection between this and the history course is obvious.

Arithmetic and Mathematics.—This subject would be independent of years, being subdivided into classes, promotion from which would depend solely on examination results.

During the first year a pupil should master prime numbers; G.C.M.; L.C.M.; vulgar fractions; decimal fractions; *approximations*; the metric system; interest, simple and compound; and percentages of all kinds—*i.e.*, up to the standard of the lower grade leaving certificate.

At least one hour a week is to be spent in totting, in revising the compound rules, and in speed work generally. The usual short methods for multiplying, &c., should be given, and practice taught, but used as it is in business.

In the second year the pupil may go on to discount; short methods for interest; annuities; stocks; exchange, with involution and evolution; and generally the work of the higher grade leaving certificate, with quick work as before.

The third year will exhaust the subject, involving a knowledge of logarithms and duodecimals.

Geometry.—For commercial scholars I prefer not to follow Euclid in the first year, but such a book as Hill's "Lessons in Geometry," along with mensuration, taught, both practically, as part of the elementary science course, and by rule. Pupils may in this way discover for themselves all the workable facts in plane and solid geometry, with the additional advantage of having actually employed them experimentally. The course of geometrical drawing should be co-ordinated with this.

Algebra presents no difficulty to pupils who are properly taught, and the great majority of boys and girls can reach the standard of the lower grade leaving certificate in one year, or at the utmost two, while three years are ample for the higher grade.

Mensuration should be taught from the beginning. As soon as a child knows what a square foot or a cubic foot is, he is ready to measure floors, walls, &c. Two years are ample time, with only one hour per week, to enable a lad to do land surveying

and other branches of practical work, and the third year should be largely devoted to such field work.

Trigonometry may be begun in the second year by such pupils as are far enough advanced in algebra and geometry, *i.e.*, who can work quadratic equations and have some knowledge of similar figures. Beginning with simple solutions of triangles drawn to scale and measured experimentally, the subject will, as a rule, receive systematic treatment in the third year, though logarithms may, with advantage, be introduced earlier for the sake of compound interest in arithmetic.

Science.—The course for Higher Grade Science Schools is sufficiently indicated in Circular 234, viz., elementary physics and chemistry; and where a commercial and science course exist together, the first year may be identical. In the second year commercial pupils may drop manual instruction while continuing geometrical drawing, and they will devote three hours weekly to alternative chemistry and physical geography (not "physiography"), as a preparation for more distinctively commercial work. In succeeding years commercial products will be studied in detail, class work being supplemented by visits to museums and factories, as in France, Germany, and Antwerp.

Modern Languages should be taught on the lines of the Society of Arts examinations rather than on the classical lines of the leaving certificate—for instance, the only "classical" author read would be Molière. A French or German newspaper might form a weekly lesson in the third year of study, and commercial correspondence would be carried on, based upon Asher's well-known handbooks.

If the present Society of Arts examination, with its division into literary, commercial, and technical sides, could be supplemented by a searching oral examination to test pronunciation and fluency, a distinct advance would be made.

In the fourth year pupils who have passed in French may be allowed to take Spanish or Italian, languages which their thorough knowledge of French would enable them to acquire very well in a single session.

Book-keeping calls for no remark save this, that we have no difficulty with rather less than the time allowed in getting first-year pupils to pass the leaving certificate. It seems advis-

able, therefore, either to raise the standard or institute a higher grade certificate equal to or beyond the Society of Arts diploma.

The pupil who enters a Higher Grade School of Commerce by the door of the merit certificate will have his work cut out for him. I have no desire to create an educational Cave of Adullam for those who are discontented with the severe discipline of the classical or science courses; nowhere is life more real, more earnest, than in commerce; and every hour in every class should be held in trust for the production of a citizen. Indeed, the lessons in history might with equal propriety have been called politics or citizenship, and the suggested treatment of geography has been carefully designed to cultivate that spirit of imperialism which is born in all Scotsmen. There are no "little Scotlanders."

I am a firm believer in race and heredity, in the *perfervidium ingenium Scotorum*, in porridge and the Shorter Catechism. No race in the British Empire has shown such intense and manifold business capacity, no British race has less difficulty in acquiring modern languages. If, with all his educational advantages, the foreigner is just able to keep abreast of us—and some people do not admit that he is abreast—what would *our* boys not accomplish with continental training?

I am privileged in being able to announce that the School Board of Glasgow has this month set aside five schools for purposes of higher grade commercial instruction, and doubtless a slight rearrangement of the bursary system will follow to suit the altered conditions of the new Code and the merit certificate.

It now rests with the parents of Glasgow boys and girls to see that these are not defrauded of their educational heritage by being unduly withdrawn from school, and it rests with the merchants of Glasgow to follow the example of London and Liverpool by putting a premium on the leaving certificate of such a Higher Grade School of Commerce.

XV.—*Reasons for rejecting Physico-Chemical Theories of the Origin of Life.*

By WILLIAM WALLACE, M.B., C.M., M.A.

[Read before the Society, 15th March, 1899.]

IN the world around us we easily distinguish between living and inanimate bodies. Many maintain that there is some absolute differential characteristic between them, yet no one has succeeded in making a satisfactory and acceptable definition of this characteristic. At the outset, therefore, it may be admitted that it is hazardous to attempt to discuss the origin of something that we can hardly define. A spirit of mystery has always seemed to surround this subject. Primitive man failed to draw a sharp distinction between living and dead objects because of certain superficial resemblances, and the modern scientist inclines to deny any fundamental difference because of certain deep-seated resemblances. To discuss the origin of life, if it has had an origin, would therefore be to deal with a special aspect of a wider problem, viz., the nature of life in general.

The nature of life and its origin, if not of the most fundamental human interest, is still of such deep interest that what we believe in this matter is held as indicative of our other general beliefs. Everyone carries in his own heart some deep-seated belief, either traditional or acquired, so clearly defined and well beloved by him, that it is with a feeling of pain that he listens to the exposition of a theory that happens to be contradictory to his own. The sense of contradiction is more affected in this, we imagine, than in political antagonism. We may interest ourselves in politics as we please, but we must interest ourselves in the nature of life. Here we are in the midst of living beings, indeed are ourselves living beings, living under the pressing intellectual necessity of being able to explain our own existence.

This paper does not aim at being an exhaustive and systematic logical statement of this problem, but is to be regarded as a provisional statement of the nature of the origin of life, and at the same time as directed against a certain tendency of thought that has existed since the atomic theory of the universe was propounded, a theory which has given a bias to this department of science at the present day, and which it has become fashionable to adopt.

If everything is reducible to a common principle, or has sprung from a common cause or common primordial being, as every philosophy tacitly or explicitly assumes, and if at one time life did not exist, the phenomena of life must be regarded as a timeous and special manifestation of this common principle. But if we regard life as an everlasting and uncreatable attribute of nature, then we shall have to enhance and enrich our conception of nature and its antecedents.

It, therefore, appears that the manner in which we shall regard the problem as to the origin of life depends on whether we believe that life always existed, or that at one time there was no life. If there was no life at one time, how did it come into being—was it more or less slowly evolved, or did it spring quickly into existence? The principle of unity, which every philosophy claims, is useful also as a test of the validity of our theory of life.

It is easier, however, to claim, than to attain to, unity, and we shall recur to this principle when testing the unity of the theories which we please to consider correct.

To recall to your minds the fundamental nature of the antagonism which exists between the vitalists—or those who believe in a vital principle—and the non-vitalists—or those who deny such a principle and hold that life is what may be called a complex physico-chemical phenomenon—we need only mention that this biological problem forms a side issue in the classic contest whether mind or matter is the common denominator of all things. So far as present-day scientific literature is concerned, the vitalists are treated as an enemy disarmed, and to be pitied rather than to be convicted. And, as in all probability the majority of the members of this Society are in substantial agreement with those whose writings I have referred to, they will prefer to regard this paper as an apology for the vitalists rather than an attack on the validity of their beliefs. But that is not so, for I am not defending a vital theory, but denying a mechanical

one. If this were a religious institute, I should be denying the vitalistic theory.

The votaries of each of these theories see the defect in the others' system which they themselves feel. He who believes in a mechanical basis of life feels his position weak, in that he is unable to construct a living being, and he looks ridiculous in the vitalist's eyes; and the vitalist feels his position weak, being unable to isolate and demonstrate the vital principle, and he in turn looks ridiculous in the other's eyes. Having thus made clear the attitude in which we are approaching this problem, we shall proceed to discuss the hypotheses that have been tendered in order to explain the existence of life upon the earth.

The present state of scientific thought is the outcome of a gradual process of observation and experimental reasoning. Geological considerations on the one hand, and that branch of experimental biology which relates to organic cultures of micro-organisms on the other hand, limit the problem; and, from time to time, the limits of the problem have been narrowed down in both directions. The period at which the earth became cool enough to be compatible with the existence of living beings has been gradually reduced from countless millions to approximately thirty millions of years. Likewise, in the study of organic cultures, it has become all but universally accepted that in a sterilised and protected medium life never begins to exist. The earth then, if this reasoning be correct, at a comparatively recent period, in virtue of its own high temperature, must have been devoid of life. No sterilisation could have been more perfect, yet, unlike the sterilised medium, the earth becomes a hotbed of life. The resemblance to the sterilised medium in the sterile test tube is apparently complete: it fails in the sterilisation, or in the sterility of the earth medium. The resemblance is complete, in that both are perfectly sterile in the first instance, but that, in the case of the test tube, the non-appearance of life is due, either to the medium in the test tube being less complex, or to there being too little time for life to originate, as in the case of the earth after cooling, for the chemical elements here have time and opportunity to assume the characters of life. The comparison is defective in regard to the assumption that the earth was at one time sterile. The process of cooling, in regard to solar life in the solar system, must be viewed from a wider aspect of sidereal distribution than has hitherto been done.

But since scientists have taken the view that life began to exist since the cooling of the earth, we will first consider their position. From the point of view of probabilities, they have to contend with obvious difficulties. If at one time the conditions on the face of the earth were incompatible with life, the cooling would take place gradually, and the temperature, if not incompatible, would be unfavourable. Life could only exist with difficulty, so that the time for life originating, if that depends at all on favouring conditions, would not yet have arrived. We are tempted to ask at what temperature is it that life is most easily lighted up? It is easy to obtain an experimental fall of temperature, from temperatures that are incompatible with life on account of their highness, to temperatures that are too low for life to exist in. And yet, if life did originate, it must, by hypothesis, have done so in a mean between these extremes. The same reasoning may be applied to all the other conditions of life, and it must be observed that any or of all the conditions acting together would not cause life. There is a wide difference between conditions being favourable to life and conditions creating life. We can easily imagine a set of circumstances favourable to the existence of life, but we see no reason why they should be thought to tend to produce life, or that the conditions of life should be confused with the problem of the production of life. Thus the chemists have an ample supply of all the chemicals which are found in living bodies, and, in so far as they have intelligence and the accumulated experience and appliances of their art, they have a vast superiority over the disorganised chemicals drifting on the face of a cooling planet. So that even now, when conditions are not only compatible with life, but also with intelligence, we neither find life beginning to exist naturally, nor by art. It is highly improbable, therefore, that life appeared on the earth since the time of its cooling—that is, it must have existed prior to the cooling of the earth. The idea, then, of crude spontaneous generation may be summarily and finally dismissed. Most scientists agree in this, and we may therefore direct our attention to, and examine, some of the specific methods they have proposed for meeting the difficulties of spontaneous generation.

Since scientific observation and experiment have brought to light so many difficulties to the theory that life began to exist since the cooling of the earth, the problem has assumed a more philosophic aspect, and we may quote Helmholtz's method of

expressing it—"It appears to me to be a wholly correct scientific procedure, when all our endeavours to produce organisms out of lifeless substance are thwarted, to question whether, after all, life has ever arisen, whether it may not be even as old as matter, and whether its germs, passed from one world to another, may not have developed where they found favourable soil." "The true alternative is evident: organic life has either begun to exist at some time, or has existed from eternity."

Richter and subsequently, independently of him, Helmholtz and Lord Kelvin developed the hypothesis that life on this earth may have been derived from a sidereal or extra-terrestrial source carried upon meteoric stones. These considerations have been made on the assumption that life is eternal, and has existed in the form of cells in other heavenly bodies. We are confronted here with another curious aspect of this question. Merely because we have failed to produce organisms out of lifeless matter, these scientists have concluded life may be eternal. It is difficult to see that it is logical to take this positive attitude from so negative a reason. This pyrotechnic hypothesis may be brilliant, but it shows to what wit's-end theories researches in physics and chemistry have driven biologists.

Although, however, the problem has now assumed a more philosophic aspect, in that the alternative that life has been eternal is recognised, most biologists cling to the old belief in spite of its difficulties. The learned Verworn remarks that "Nägeli, one of the most talented botanists, says rightly: 'One fact—that in organisms inorganic substance becomes organic substance, and that the organic returns completely to the inorganic—is sufficient to enable us to deduce, by means of the law of causation, the spontaneous origin of organic nature from inorganic. To deny spontaneous generation is to proclaim a miracle.'" One of the attributes of an organised being is that it can render unorganised matter organised, but this is always done by assimilation, and never with the proximate principles of life *de novo*.

Sachs also believes in the purely physico-chemical nature of life. "The aggregate of properties by which a particle of iron is absolutely distinguished from a particle of oxygen is as unknown and much more invariable than the aggregate of physiological causes which distinguish the inherited properties of an oak from those of a pine." "The historical explanation of a natural

phenomenon does not exclude its explanation from a physical point of view, but, on the contrary, includes it." And Claus says that "The physico-chemical origin of life appears to be a necessary postulate in order to explain the first appearance of organisms."

I might refer you to numerous other continental names of those who advocate the advent of life from inert matter, but we shall now revert to some of our home exponents.

Tyndall saw in matter the "promise and potency of all terrestrial life." Tyndall, as representing the scientific side of the philosophic school of Comte and Mill, whose cry was "avoid abstractions," is a bad exponent in his use of the words "promise and potency."

I have been for some time impressed that there is no fundamental difference between the Mosaic and Darwinian statement regarding the first appearance of life upon earth, but an indubitable resemblance. Both are merely adapted to the susceptible ear of a laity by a recognised leader. In the earlier instance we have a substantial visible piece of matter assuming the attributes of life a few thousand years back; in the later instance a microscopic piece a few million years back. Moses called his living mass Adam; Darwin called his living mass the primordial protoplastic cell. Moses is represented as knowing the vivifying power; the state of opinion about the middle of this century prevented Darwin making a positive statement, but he inclines to the idea that it was spontaneous—he says by this expression he does not mean by chance, but that he uses the word for want of a better. The first appearance of life rests upon an unexplained event or act in both cases.

The difficulty attending spontaneous generation is somewhat dexterously contended with by Herbert Spencer. With him life does not appear upon earth with rapid meteoric flight, it is a gradual process—a part of evolution—there is no absolute beginning. "The affirmation," he says "of universal evolution is in itself the negation of an 'absolute commencement' of anything." "The conception of a 'first organism' in anything like the current sense of the words is wholly at variance with the conception of evolution." The origin and evolution of life is a special phase of evolution in general, a universal change from the homogeneous to the heterogeneous which is taking place universally. Starting with the nebular hypothesis of creation, in which the universe is represented as being pervaded by a

homogeneous mist of matter, Spencer first evolves the sidereal systems, and then, in the case of this earth, at least after the cooling process, life is evolved. The carbon compounds, and the elements of which these are composed, possess, by their very nature, such qualities that, as their combinations become more complex, they become more and more like living matter. These chemical compounds, acting and reacting on one another, and acting and being reacted on by their environment, would be constantly increased and diminished. And those compounds which were suitable for the surroundings would increase more than those which were less suited, hence a primitive molecular struggle for existence. It is much against this theory that research points to there being only one source from which all the existing forms are sprung. Some one cell has at one time arisen and its descendants have superseded all the rest. There is another fundamental objection to Spencer's theory. It is as rational to expect order out of chaos as to expect heterogeneity out of homogeneity. There is an obvious resemblance between creation out of chaos and organisation from a nebular origin. This assumption that at one time the universe was in a chaotic or nebular state is unsupported by reason and observation. To account for the order of the universe, we must fall back on a pre-existing order, and so on *ad infinitum*; an argument which warrants the conclusion that an order, potentially equivalent to the existing order, must always have existed. In other words, there never was a creation. Similarly we reason in regard to space and time. Our knowledge of their infinity depends on being unable to prescribe a limit to either in thought, and we conclude that they are without limit.

Akin to Spencer's solution of the problem is Preyer's hypothesis. He, like Richter, regards life as eternal, but presenting also a phase of evolution. The present forms of life are adapted to present conditions, temperature amongst others. Before the earth cooled to its present temperature, an organic era existed of a different type, not necessarily a different morphological type, but a different chemical type—able to withstand fire, or rather to exist in a fiery state or atmosphere. If we consult Mendelejeff's "Classification of the Elements," silicon probably took the role of carbon, and the atmosphere probably was chiefly composed of sodium, sulphur, and phosphorus. Verworn thinks that this type of organisation is scarcely comparable with

the existing types. It must, however, be conceded that the belief that life has existed from eternity is more in consonance with reason and observation than that it was created or was evolved. Evolution presupposed a potentiality equivalent to the effect. All evolution theories have failed to elucidate the nature of this potentiality.

The creation and evolution theories depend upon a misconception as to the nature of life or organisation. It is impossible, in the first place, to conceive the universe in the nebulous state. Such a conception makes order and organisation an accident. The idea of disorganisation is only relative, and not absolute. A certain amount of matter may become disorganised relatively to its previously organised state, as when an animal or plant dies. It then becomes a part of a wider organisation, to which the earth belongs. But it is natural that so wide a generalisation should escape our reasoning, that we should revert to narrower considerations, distinguish absolutely the living from the dead, and make many arbitrary distinctions.

In looking around among natural phenomena, one feature strikes us with a searching curiosity, the automaticity displayed by various phenomena—animals and plants on the one hand, and the sidereal systems on the other. The automaticity of these units is unquestioned—*i.e.*, the units with which biology and astronomy have to deal. What are these automatic beings essentially?

Men at all times have busied themselves trying to create something with this characteristic of automaticity, trying to invent a machine or body with perpetual motion, to resemble the natural automatons referred to. It is needless to say that this is impossible and absurd. Yet this infatuation has played an important part in the advance of science, and exists at present more wide-spread, and in a more insidious form, than perhaps it ever has done in the history of science. Chemistry and biology are corrupt with it. There is scarcely a chemist but believes that biology is merely a domain of chemistry unexploited, and there is scarcely a biologist but admits this. Both think it but a question of time until chemical synthesis of carbon compounds eventuates in the creation of a chemical automaton. Thus we are trying to accomplish with chemicals what in earlier times it was fashionable to attempt with clockwork. Newton is said to have been touched with this phantasy. The idea that living beings can be created *de novo* by nature or by art is nearly as

common as it is absurd. A proper recognition of the idea of the unity of the universe would dispel this fallacy. The universe is an all-inclusive organic automatic unity; every organic unit is a partial manifestation of this universal unity. If all the minor organisms were not merely parts of the one major unity, then the unity of the universe would be destroyed. To make a new organism, in the right sense of the word, we would require to get matter that did not belong to the universe proper; or, to speak metaphorically, to create an automaton or homunculus, we would require to steal fire from heaven. There are a great many Prometheuses going about at present; those of the clockwork type, if there were any known, would be tortured with ridicule, but those who study chemistry pride themselves in their imaginary larceny. The idea, however, of stealing fire from heaven is morally wrong; it is an *ignis fatuus* of man trying to create what he himself at best is but a manifestation of.

An analysis and comparison of the various automatic units that come under our observation are necessary to understand why life cannot be created. Let us compare a living corpuscle or cell, which is an automaton, and the solar system, which also is an automaton. In making this comparison between an object extremely small and an object extremely large, I am not relying upon your imagination for one of the terms of the comparison, as in certain discussions you have been frequently asked to do, even in this room. When speaking of the different colours, your imagination has been called to deal with a vibration of the duration of from 4 million millionths of a second to 8 million millionths of a second. And likewise you have been called upon to realise the size of an atom by multiplying its magnitude by an integer with 23 nothings to the right of it. The corpuscle and the solar system are objects of observation; nay, they have been carefully observed, and it is the more salient of these observations that I am about to direct your attention to.

A blood corpuscle resembles the solar system in its general shape and form. Their geometrical relationships are the same. They are flattened discs, and have poles and a circumference. They have a similar material basis. If the atoms that compose a blood corpuscle could be represented as large as oranges, then, on a similar scale, the blood corpuscle itself would be ten miles in diameter. But I shall not further indulge in the stretches of the modern scientist's imagination. The dynamic properties of the

one may be compared with the physiological properties of the other. Both move as a mass, and their parts move in relation to one another. Both respond to external stimuli—the one perturbates, the other shows irritability when a foreign body approaches. The processes of integration and disintegration are recognised as common to both while they maintain their identity. Both have passed through various phases of development before reaching their present highly differentiated state, and it is also certain that this process being carried further, they will cease to exist in their present form. And if modern science assures us of anything, it assures us of this, that objects that are homologous, or have all their attributes in common, are also homogeneous—that is, they have a common descent or origin. The solar system, therefore, has sprung from the same ancestral source as the blood corpuscle, and it is infinitely more correct to say that we are children of the universe than combinations of atoms. One statement conveys a truth, the other a misconception. And thus we are related, not only to animals and plants, but also, roughly speaking, to the stars.

Now, in the first part of the paper, we criticised the illogical sequences of modern science; in the latter part, we have concluded with the logical sequences. We therefore contend that the solar system, and all the sidereal systems, and the blood corpuscle and every living cell, have had a common origin, and their concerted power of movement, vitality, or organisation, which they have in common, is an inheritance from eternity. They are all part and parcel of one organic whole. There can be no true dismemberment or creation. Whatever is taken away from one unity is absorbed by another. Every organic unit, in virtue of its descent, has a universal relationship. The organisms of this earth are not only related and adapted to the conditions of this earth, but to the universe as their whole environment. And we also are sprung from this universal unity, and are realisations and manifestations of it.

The nature of the distribution of organisms in the universe may be deduced from these considerations. It may safely be asserted that the universe, in a general sense, is replete with organisms, as well as with organisation. The distribution of organisms, and beings that would merit the name of living, is a matter concerning which a fairly dogmatic statement might be made. It is almost certain that throughout the universe, and, to speak more par-

ticularly, on all the planets of this system, there are forms of life similar in their cellular structure and function to those on this planet. It is not unlikely that intelligence also has been developed elsewhere. For taking into consideration the similarity of the conditions on these planets, multicellular units or organisms should readily have been evolved; so that in other worlds than this, the spirit of the universe may be contemplating its own magnificence.

XVI.—*Report of a Conjoint Visit of the Geological and Philosophical Societies to the Dumbuck Crannog, 8th April, 1899.*

By JOHN F. CAMPBELL.

[Read before the Society, 26th April, 1899.]

ON Saturday afternoon, 8th April, a party of about 150, consisting of members and friends of the Geological and Philosophical Societies, arrived at Dunbarton.

Walking to the Bonhill Road, then following a cart track, the first stop was made in Strowan's Well Quarry, which was explained to be an intrusion of trap of late date through the sandstones. Attention was called to the grain of the stone as seen in the kerbs, setts, and road metal for which it was being utilised. At the sides of the dyke, where cooling was more rapid, the crystals were so small as scarcely to be visible, but in the centre they were bold and better defined.

Leaving the quarry, Dumbuck foot was passed, and the columnar basaltic formation on its crest pointed out. A short walk eastwards brought the party to the gusset of the roads, and, returning by the Dunbarton Road some distance, a narrow belt of planting (locally known as the witches' planting) crossed the road. The road was left here, and, passing down this wood, the railway was crossed and the shore reached.

A causeway, not unlike the ruins of a drystone dyke, stretched far out into the river. Using the whole length of this as a footpath, then stepping over a few yards of soft sand, the crannog was reached, where Mr. Donnelly and his *factotum* were waiting.

Mr. Donnelly described his find exhaustively, and answered the many questions put by those present.

A vote of thanks, proposed by a lady, brought a delightful outing to an end.

Capricious nature was in her most charming mood, lavishing her smiles. The views from this spot are exquisite, making pictures of wondrous beauty. Here, is the silvery sheen of the

river; there, the peaceful pastoral banks; and, around, the rugged grandeur of the seemingly enclosing hills, all overtopped by the mighty Ben Lomond, whose snow-clad head and shoulders gleamed and glistened in the April sun like purest translucent alabaster.

The whole district teems with striking associations, geological, archæological, antiquarian, and historical,

Immediately to the north is Dumbuck, and, westwards, Dunbarton Rock, both of which our geological friends told us were the volcanic vents whose outpourings formed the Kilpatrick and Renfrewshire hills. On Dunbarton Rock, and also on Dumbowie —which latter is just hid by the shoulder of Dumbuck—are prehistoric forts, and about three miles north-easterly is the place where Mr. Donnelly discovered what are now known as the Auchintorlie cup-marked stones.

In front, south-westerly, was the Dumbuck Shoal and Ford, that first great natural obstacle our forebears had to remove in their monumental work of deepening the River Clyde, a work of which we are all so proud, and on which the very existence of our beloved city may be said to depend.

In a report like this it is not possible to give much of the multitudinous details, but a study of the drawings before you will furnish more information.

The remains of this pile dwelling stand 250 yards below ordinary high-water mark, on a nearly level beach, but a few yards further the bank shelves rapidly, by reason of the scour of the current, until the bottom of the river is reached, which has to be kept by the never-ceasing work of the Clyde Trustees in their fight against the unresting forces of nature. The tides cover them to a depth of 7 or 8 feet.

The crannog, as now seen, is a well defined circle about 56 feet 4 inches in diameter, consisting of 27 oak piles with bark on, surrounded by a kitchen midden, or refuse heap, of 14 feet broad, and 3 to 3½ feet deep. This has a buttress or breakwater of timber, built like an amphitheatre, of nine steps, kept in position by soft wood piles, and being further protected by a pavement of boulders, 22 feet broad, laid in the blue clay. This pavement, like all the other floors and causeways, is grouted with macerated bark, clay, small stones, and gravel.

The piles of the dwelling proper are of varying length. Their tops are shaped in an oval, conical form, meant to make a joint in a socket to erect the superstructure on. The bottom is pointed

like a sharpened pencil, the tool marks still showing. The piles have been driven into the clay. All have braces of timber; some of those are natural knees; others are of solid wood with a deep check cut out; all are wedged; in some, trenail holes are visible. The laboured parts have scorched marks. The braces are laid running into the centre.

The upper floor is made of hazel with the bark on, of lengths varying from 5 to 10 feet, and diameters of 5 to 8 inches radiating to the middle; immediately beneath is another layer of same construction, but the timbers run transversely.

The lowest floor consists of twigs, small branches of hazel and fir, on a bed of heather and bracken, laid on boulders which rest on clay puddled with wattle, of a depth of 12 inches.

Five large oak sockets lie on the surface some distance inside and around the outer edge. These are firmly built with stones and timber, and jammed hard. On them is cut a butt or check at an angle of 45 degrees, and a socket hole of 25 inches deep by 12 inches diameter, counterbored with a trenail hole. The whole meant to act as struts to stay the upper buildings.

In the centre is a well of 6 feet diameter, 4 feet deep, built with boulders, having a cope of larger stones; this latter is raised 15 inches above the floor level. The stone walls have a puddled clay facing, then wattles of hazel 1 inch thick, plaited and twisted around, and puddled again at bottom and sides with wrought clay, 12 to 15 inches thick.

It is still watertight.

Raised mounds of boulders, 6 to 7 feet diameter, are round the well, rosette fashion, the whole being surrounded by a row of soft wood piles. At the west side of the well is a small causeway, 6 feet broad, made of boulders, held together by piles.

Outside, about 20 yards north-eastward, was found a dock, 40 feet long, facing south-easterly. Its sides are piled, and struts of wood are laid among the boulders which form the dock.

In this dock, a very little below the surface, was a canoe—a dug-out formed from an oak tree—which still shows the tool marks and the charring of the process of manufacture.

The length is 35 feet 7 inches, and 48 inches beam, with a varying thickness of 2½ to 3 inches. It has an open square stern, with a movable board; 18 inches from stem are two hand holes, 9 by 5 inches, and three holes, 2 inches in diameter, through the bottom.

The Clyde Trustees removed it to the Kelvingrove Museum to ensure its safety and preservation.

From the crannog to the dock a causeway runs, 15 feet broad, paved with boulders laid on timber (whose ends project), with the usual grout, and on the blue clay.

There is another causeway leading from the dwelling to the foot of Dumbuck, of like construction to the others, this being the footway used by the visitors. It is surmised that some connection existed between the hill fort of Dumbowie and this dwelling, as this causeway leads directly to the foot of the hill.

The finds in and around the crannog are very numerous, and are constantly being added to.

After the canoe and dock, the oak ladder found in the refuse bed attracts most attention amongst the articles of wood. Made out of a slab of oak, which has been split from the tree by wedges (on one side little has been done to dress the wood), it is 15 feet 3 inches long, 2 feet broad, and 3½ inches thick. Six holes are cut for steps, 12 inches by 10 inches; the bottom of each is bevelled to an angle of 60 degrees to make the footing level when the ladder is in position. On one side those holes show signs of wear by long use. A number of other wooden articles were unearthed, of an oval shape, like an almond, all sizes, from 18 inches long by 9 inches diameter downwards; also a quern, 19 inches diameter and 4 inches thick; and the driving bar in pieces, with burned waste of acorns and hazel nuts accompanying.

A saddle stone and roller were quite recently found, this being a most primitive mode of grinding, and since writing, a stone drinking cup.

Heaps of shells of the whelk, horse mussel, and oyster are in a part of the midden; in other parts, horns, skulls, and bones of many animals exist in profusion; some of the bones are charred, and most have been cracked to extract the marrow.

Weapons and implements of different kinds, made of bone or stone, have been got in quantity, of which the more important are a chisel of stone inserted in a stag-horn, a sharp knife fixed in a bone which has a hole at the other end to suspend it, two slab and many other stone spearheads and pounders, as well as the carved cannel or shale objects which have caused so much discussion.

No articles of metal or pottery have been found, but stones

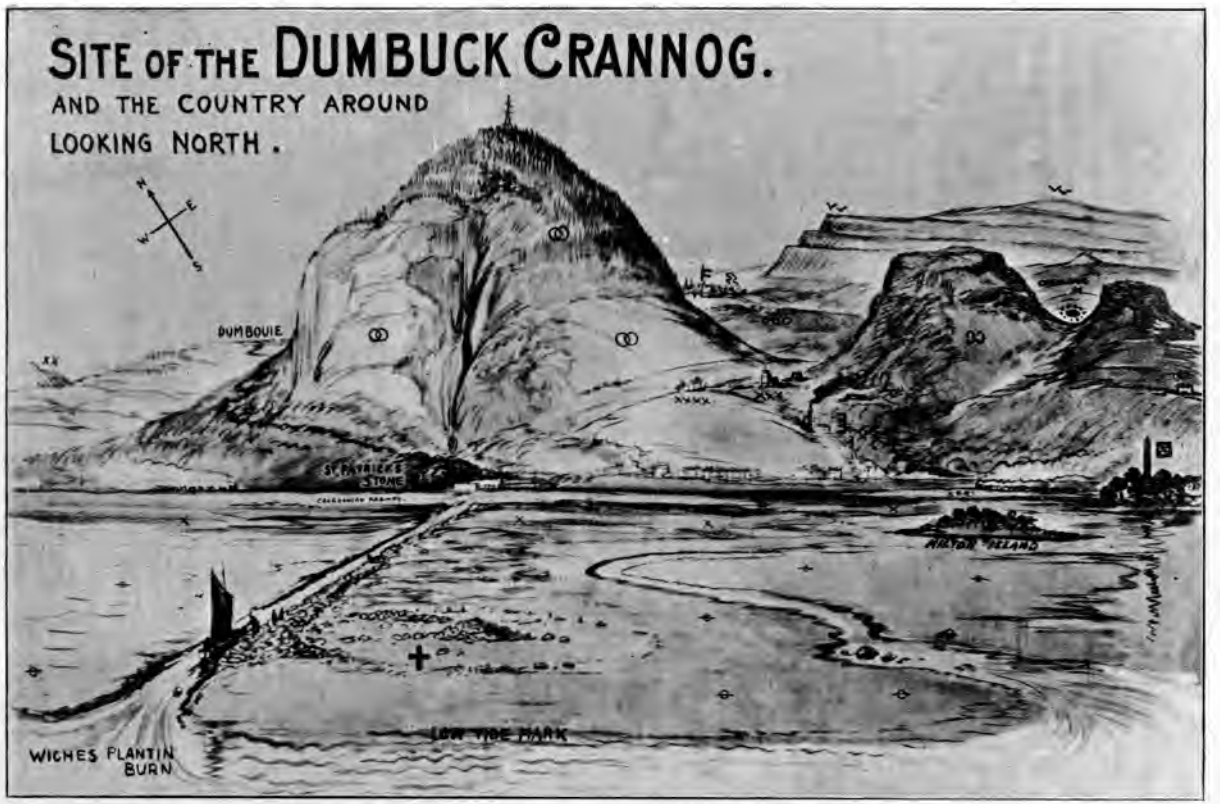

SITE OF THE DUMBUCK CRANNOG.
AND THE COUNTRY AROUND
LOOKING NORTH.
DUMBOUIE
ST PATRICKS STONE
LOW TIDE MARK
WICHES PLANTIN BURN

Fig. 1.

KEY TO
THE DUMBUCK CRANNOG.
N
E
W
S
SHELLS
SHALE
THE RIVER CLYDE
W.A. Donaldson del
14 MAR. 1899
N°1 THE WELL
N°2 RAISED PAVED MOUNDS
N°3 CAUSEWAY FROM CENTRE N
N°4 OAK LADDER
N°5 KNEED TIMBER ENDS
N°6 OAK PILES N°7 OAK JUNKS N°8 CAUSEWAY
N°9 CANOE
N°10 DOCK N°11 PAVEMENT OUTSIDE BREAKWATER
N°12 REFUSE BED N°13 CUP MARKED STONES
N°14 BREAKWATER N°15 QUERN 16 DRIVING BAR
17 RADIAL TIMBERS & 18 STONE CIRCLES ON PAVEMENT
LEADING SHOREWARDS

Fig. 2.

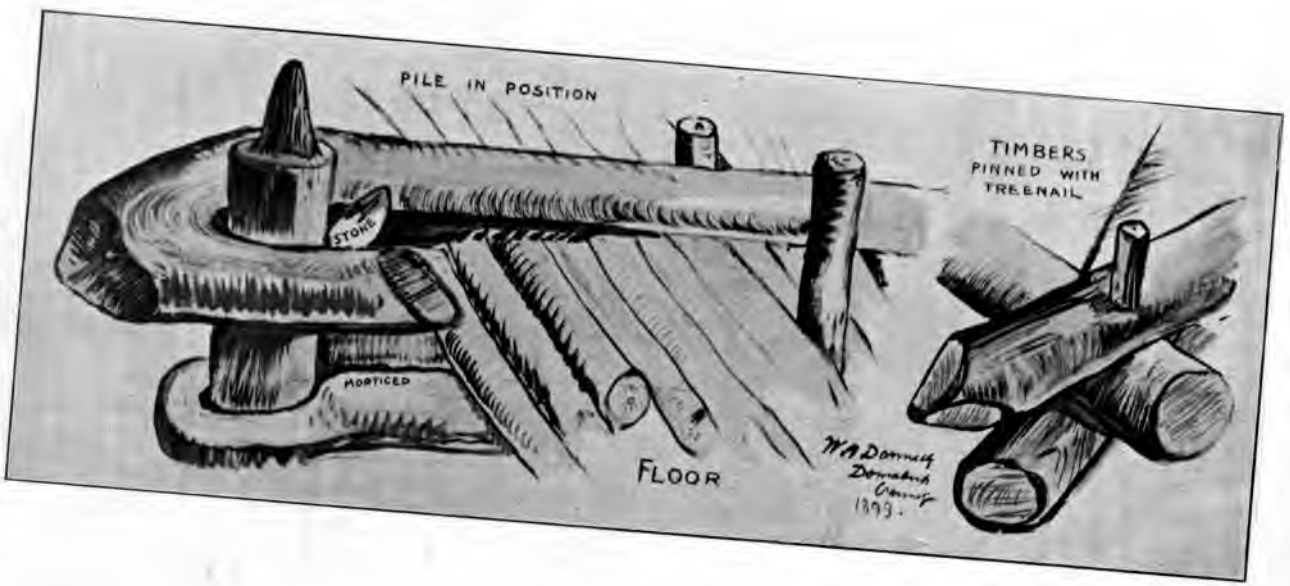

PILE IN POSITION
TIMBERS
PINNED WITH
TREENAIL
STONE
MORTICED
FLOOR
W. A. Donnelly
Donnelly
Cleary
1893.

FIG. 3.

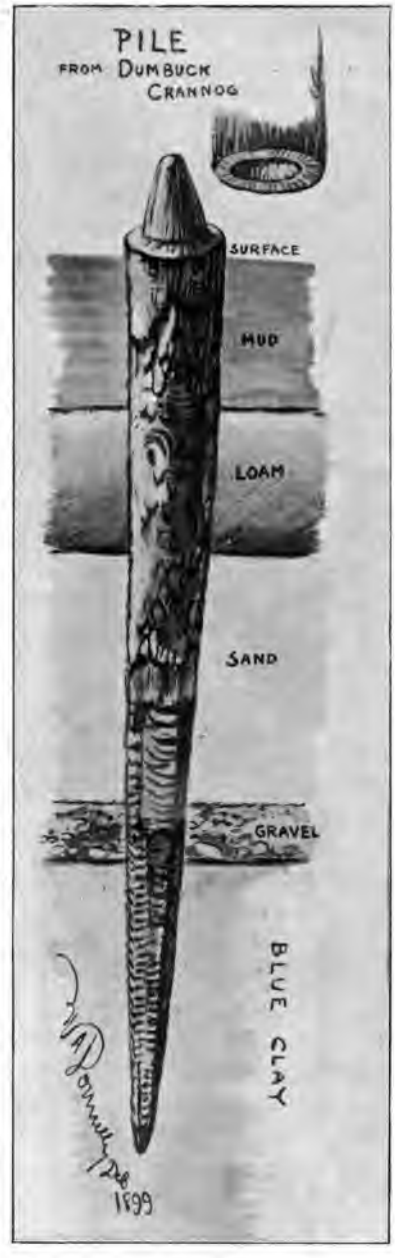

PILE
FROM DUMBUCK
CRANNOG
SURFACE
MUD
LOAM
SAND
GRAVEL
BLUE CLAY
1899

FIG. 4.

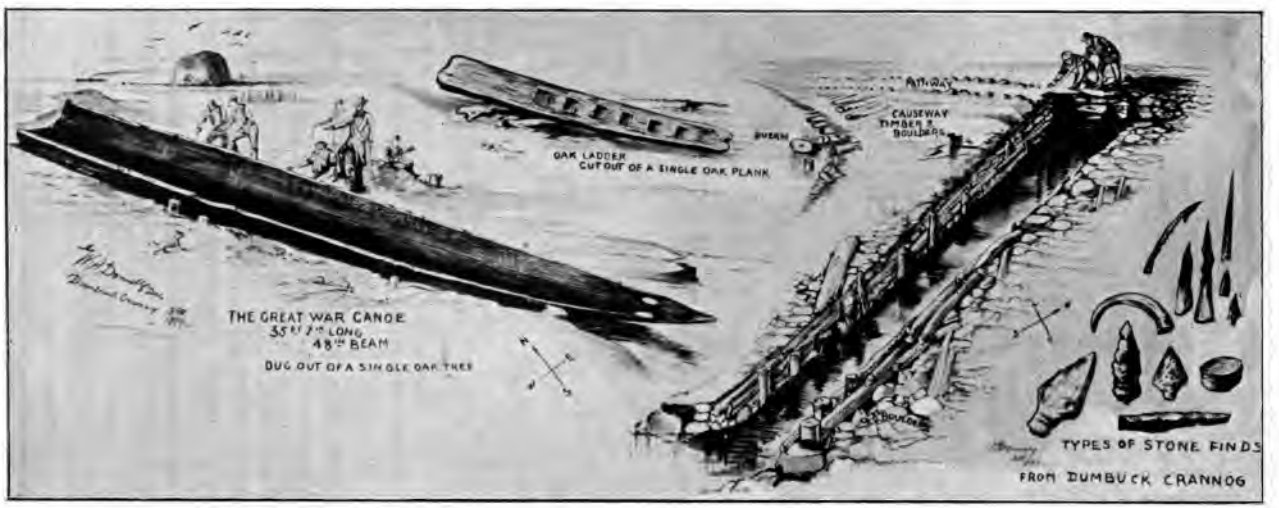

THE GREAT WAR CANOE
35ft 7in LONG
48in BEAM
DUG OUT OF A SINGLE OAK TREE
OAK LADDER
CUT OUT OF A SINGLE OAK PLANK
CAUSEWAY
TIMBER &
BOULDERS
TYPES OF STONE FINDS
FROM DUMBUCK CRANNOG

Fig. 5.

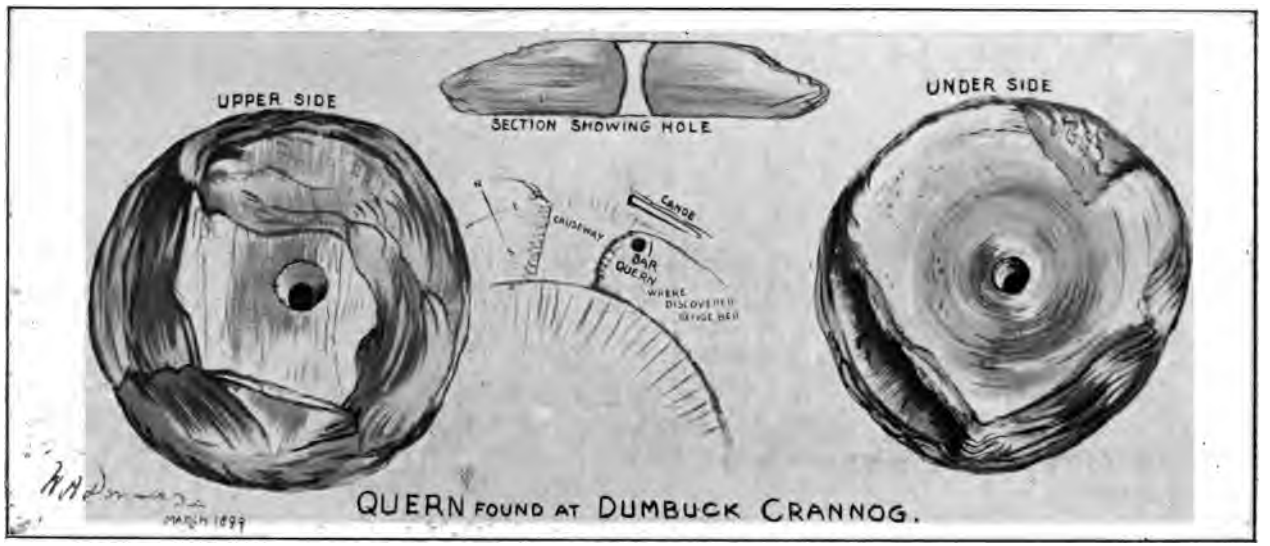

UPPER SIDE
SECTION SHOWING HOLE
UNDER SIDE
CAUSEWAY
CANOE
BAR QUERN
WHERE DISCOVERED
MARCH 1899
QUERN FOUND AT DUMBUCK CRANNOG.

FIG. 6.

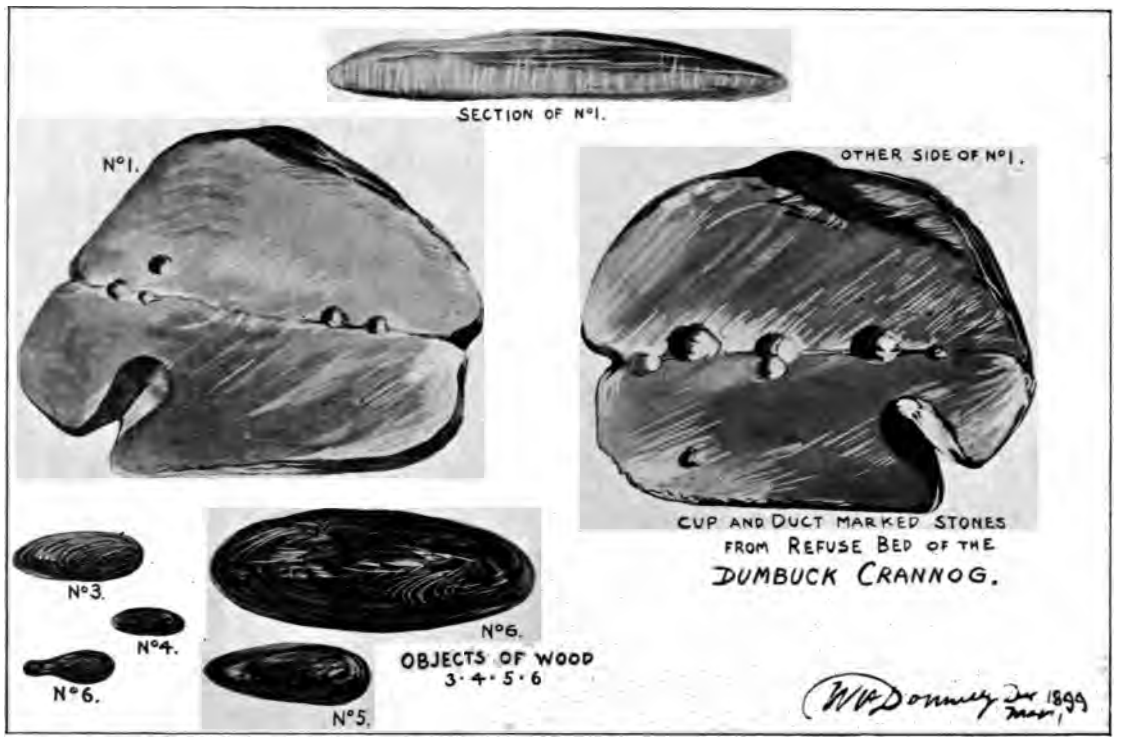

SECTION OF N°1.
N°1.
OTHER SIDE OF N°1.
CUP AND DUCT MARKED STONES
FROM REFUSE BED OF THE
DUMBUCK CRANNOG.
N°3.
N°4.
N°6.
N°6.
N°5.
OBJECTS OF WOOD
3·4·5·6
W. A. Donnelly Dec 1899

Fig. 7.

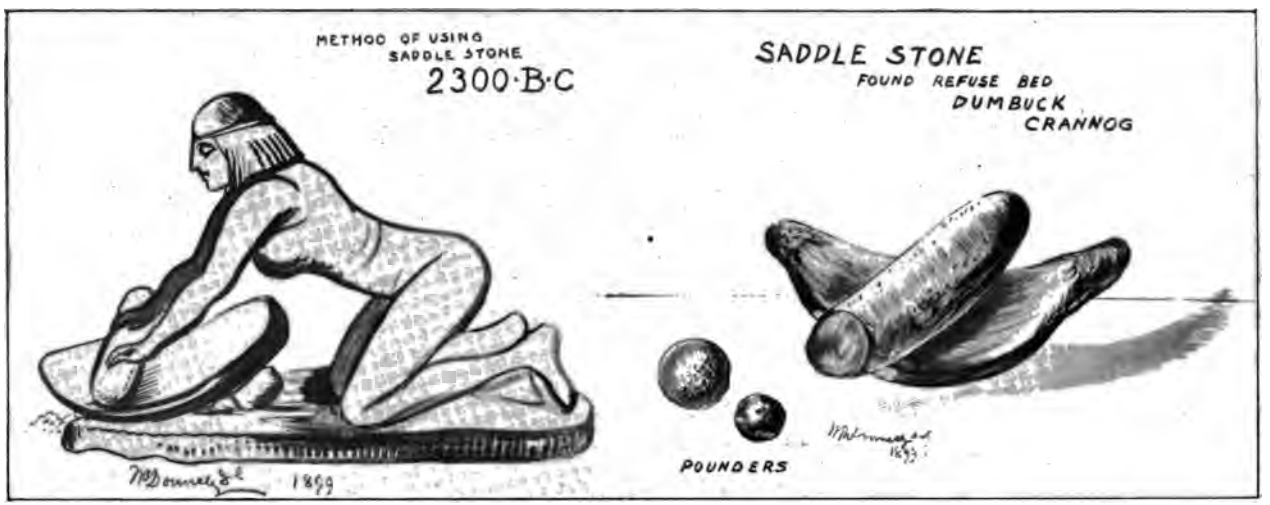

METHOD OF USING
SADDLE STONE
2300·B·C
1899
SADDLE STONE
FOUND REFUSE BED
DUMBUCK
CRANNOG
POUNDERS

Fig. 8.

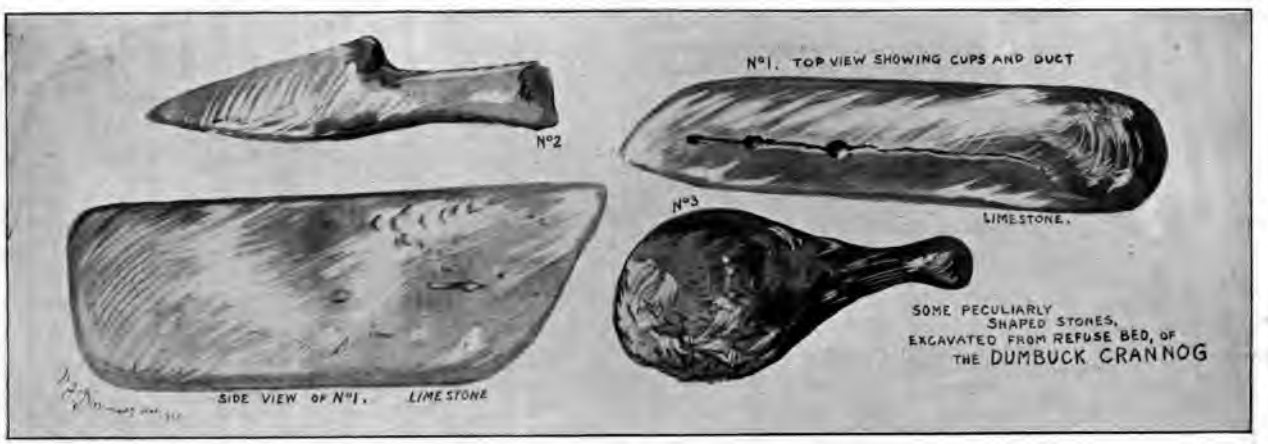

Nº1. TOP VIEW SHOWING CUPS AND DUCT
Nº2
Nº3
LIMESTONE.
SIDE VIEW OF Nº1. LIMESTONE
SOME PECULIARLY SHAPED STONES, EXCAVATED FROM REFUSE BED, OF THE DUMBUCK CRANNOG

Fig. 9.

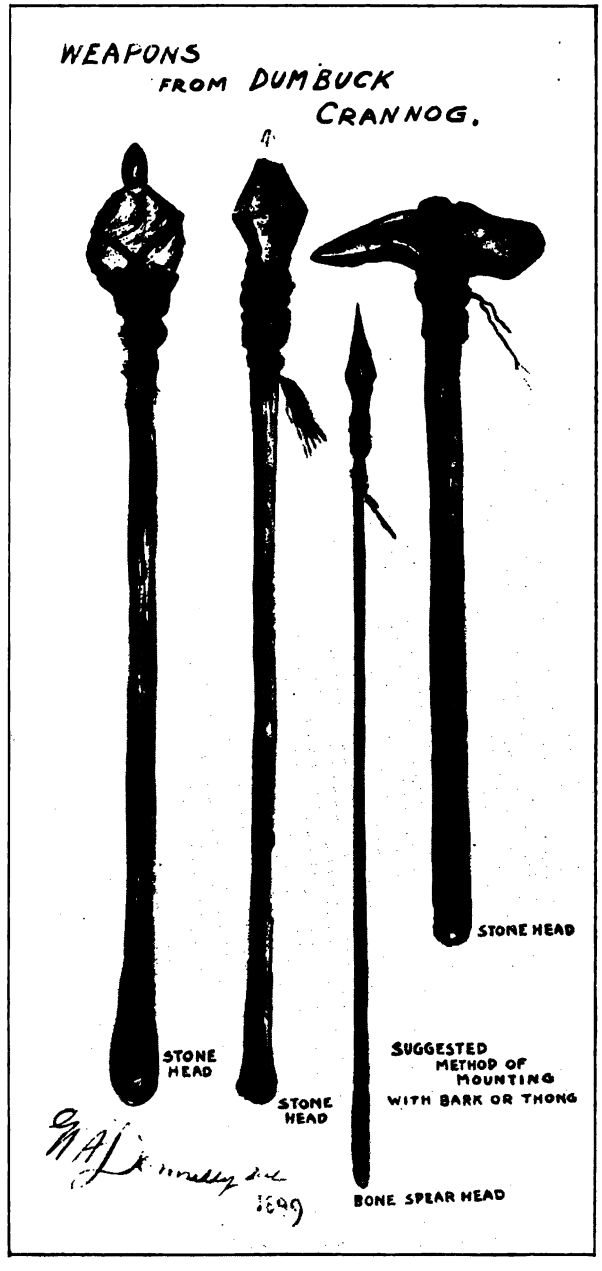

WEAPONS
FROM DUMBUCK
CRANNOG.
STONE HEAD
STONE HEAD
STONE HEAD
SUGGESTED METHOD OF MOUNTING WITH BARK OR THONG
BONE SPEAR HEAD

FIG. 10.

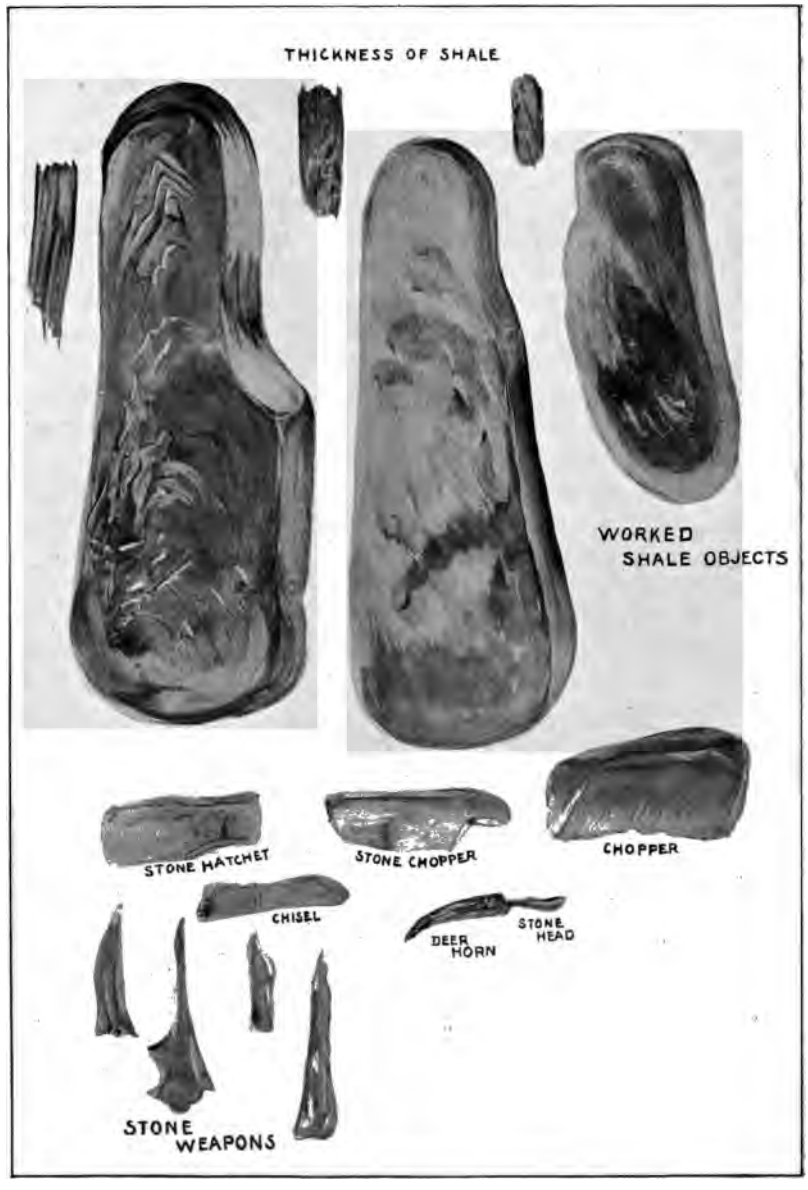

THICKNESS OF SHALE
WORKED
SHALE OBJECTS
STONE HATCHET
STONE CHOPPER
CHOPPER
CHISEL
DEER
HORN
STONE
HEAD
STONE
WEAPONS

FIG. 11.

for cooking, exhibiting signs of heating, are common; most of them are fractured.

There can be little doubt that this dwelling dates from an early period, and it is to be hoped that the continued search may bring to light some conclusive evidence of its age.

The researches of Spencer and Gillen* among the aboriginals of Australia have added to our knowledge, *inter alia*, many sacred relics and totems which seem to correspond with the finds in this crannog. It is a source of satisfaction to know that those are being brought to London, and that comparison can be made, and judgment passed.

In conclusion: the Clyde basin has been so prolific of archæological and antiquarian finds that it might be worthy of the consideration of the Committee of our International Exhibition whether they should erect on the ground in the Kelvin a model of a crannog to show the mode of living of our long-past predecessors. The building could be made large enough, at small cost, to be used as a museum to exhibit specimens and drawings of the finds around the city, and possibly from other sources as well.

[I have to acknowledge my indebtedness to Mr. Donnelly, and offer my thanks for his kindness in giving the use of his beautiful drawings and diagrams.]

---

* See Spencer and Gillen's "Natives of Central Australia."

XVII.—*Electric Discharges in Vacuo and the Rontgen Rays.*

By A. A. Campbell Swinton.

[Read before the Society, 1st March, 1899.]

When members of the general public are admitted to a scientific laboratory, they are very apt to ask what is the practical utility of the investigations that they see in progress. Frequently it is not at all very easy to give a satisfactory answer to such enquiries. In fact, as has been said by Tyndal, to the uninitiated, even the greatest of philosophers may appear but as big children playing with soap bubbles. I hope, however, to be able to show you this evening that, at any rate, in one particular line of scientific enquiry, experiments and investigations undertaken long years ago have, in course of time, brought forth fruit which is of great practical benefit to mankind.

Probably all present are acquainted, at any rate, with some of the elementary phenomena of electricity, as, for instance, with the fact that, when a unidirectional electric discharge is caused to pass in air between two terminals, the two ends of the discharge are dissimilar in appearance. In air, at ordinary atmospheric pressure, the effect is only noticeable upon very close inspection; but if the pressure is reduced, it becomes much more readily apparent. I have here a long glass tube, fitted with terminals at either end, through which I propose to pass the high-tension electric discharge of a Rhumkorf coil. At ordinary atmospheric pressure the discharge will not pass, as the power of the coil is not sufficient to overcome the great resistance of the long column of air. The tube is, however, connected to a pump, and as I remove the air you will see that as soon as I arrive at a certain degree of exhaustion, the discharge commences in the form of long, luminous streamers. As I still further reduce the pressure in the tube the latter becomes filled with an almost uniform column of luminescence. Next, this column divides itself up into numerous and continuously vibrating separate portions, which are called striæ, till at length, at about the highest degree of exhaustion

that is readily obtainable with the mechanical form of vacuum pump that I am using, we arrive at a stage when only a portion of the tube is filled with striæ, or is visibly luminous at all, the remainder, which is at one end, and is, in fact, that part which is next to the negative terminal, remaining quite dark. This is the negative dark space, sometimes called the Crookes dark space, after the eminent scientist who has done so much to investigate the phenomena that occur within it. It becomes larger and larger the higher the degree of exhaustion, till at very high vacua it may fill the entire tube. It is chiefly with what takes place within this dark space that I shall have to deal this evening.

I will now connect the Rhumkorf coil to the terminals of another tube which has been exhausted to a considerably higher degree than is attainable with the ordinary mechanical pump. It has, in fact, been exhausted by means of a mercury pump to such a degree that only about one-millionth of the original atmospheric contents remain. Perhaps you will imagine that under these conditions there is not very much left, but that is a mistake; if we consider the residue in terms of the number of molecules, there is a vast number still remaining in the tube. I would not like to be too sure of the exact figures, but it is something of the following order. When a tube has been exhausted to one-millionth of an atmosphere, there remain in every cubic inch of its contents some 180,000 times as many molecules as there are farthings in the whole British National Debt of £900,000,000 or thereabouts. Now, naturally, these molecules are very small. Lord Kelvin has calculated their approximate size, and his results amount practically to this—that if you were to enlarge a globe of glass or water, of the dimensions of a football, to the size of the earth, you would be able to see the molecules, and would find them to be rather larger than small shot, but probably smaller than a heap of footballs. Now, it is probably to the motions of these very numerous but extremely small molecules, or perhaps of the still smaller atoms of which each molecule is believed to be composed, that the phenomena that I will proceed to show you are due.

To return to the highly exhausted tube; as you will observe, when I turn on the electric current to the coil the discharge passes, but the interior of the tube remains dark. It is, in fact, entirely filled with the negative dark space. However, opposite the negative or cathode terminal, which is in the form of a flat

aluminium plate, the glass is giving out a pale green light. It can be shown that this fluorescence of the glass is caused by some form of ray or emanation that proceeds from the cathode plate; in fact, by what are called the cathode rays. In their present diffuse condition these rays are not visible, but when concentrated they can readily be seen. A strong electro-magnet, suitably placed, will concentrate them. I have one beneath the tube, and, as you will observe, as soon as I turn on the current to the magnet the cathode rays become visible, and are drawn down to a focus just above the magnet pole (Fig. 1).

When concentrated in this manner the cathode rays are highly erosive. By moving the tube I can by this means engrave a pattern upon the inside surface of the tube, or, if I allow the rays to play for a few seconds upon one spot, the glass is quickly perforated, and the outside air gains admission.

Now, what are these cathode rays? According to the theory originally propounded by Sir William Crookes, and now almost universally accepted, they consist simply of the molecules or atoms—particles is perhaps the best word, as it does not presuppose any particular degree of subdivision—of the residual gas, which, being originally in intimate contact with the cathode, and thus becoming negatively electrified, are set into violent motion owing to mutual repulsion, and consequently fly along the tube at a speed not much less than that of light. It is supposed that it is the bombardment of these negatively electrified particles upon the glass that produces the green fluorescence, and also, when in sufficient number, the erosive effects that I have shown you. We shall further see that where these travelling particles strike any solid matter, under suitable conditions, they also generate the Rontgen rays. In addition, they strike with sufficient force to cause mechanical rotation of delicately pivoted mill wheels, and under suitable conditions will heat certain substances to very high temperatures.

We have seen that the cathode rays are deflected by a suitably arranged magnetic field. They are not, however, uniformly deflected, some being more easily deflected than others.

In order to show this, an apparatus has been designed by Birkeland, which consists of a tube in which the cathode rays are caused to pass through a narrow slit in a metal plate. A thin beam of rays is thus produced, which produces a narrow band of fluorescence where it falls upon the glass. The tube is arranged

FIG. 1.

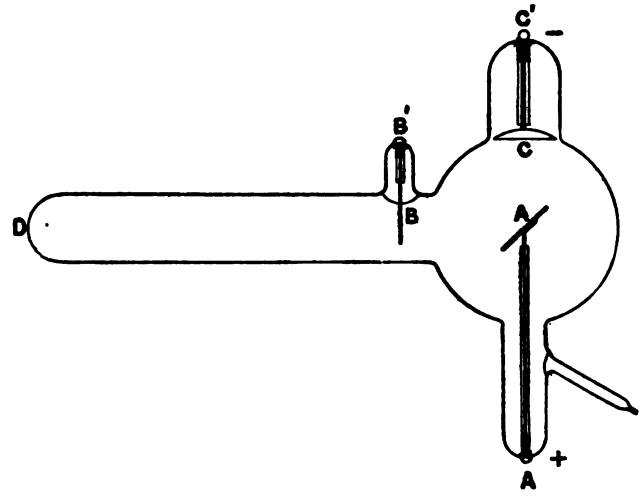


FIG. 2.

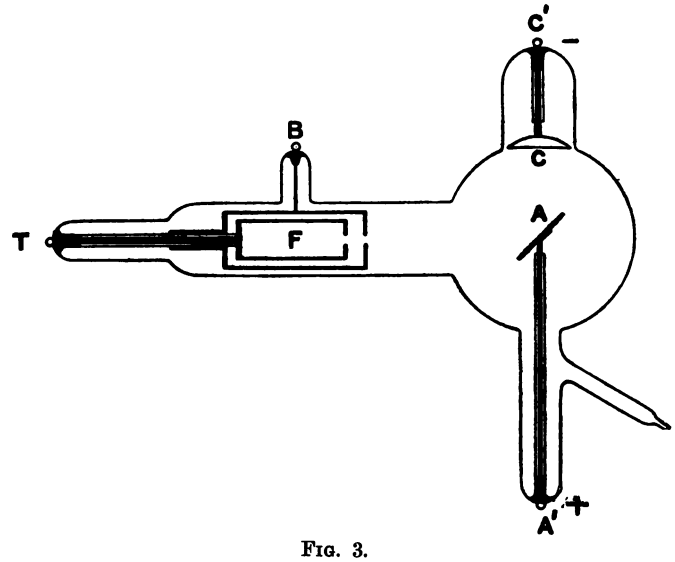


FIG. 3.

cathode rays. In this tube F consists of two small brass cylinders, one inside the other, and each furnished with an aperture to allow the rays from A to obtain admittance. The two cylinders are insulated from one another, and the outer one is connected to earth through the terminal B, so as to screen the inner cylinder from all inductive effects. The inner cylinder is connected through T to an electroscope, and it is found that, when the tube is put into action and the rays gain access to the interior of the inner cylinder, the electroscope denotes a negative charge.

It is clear, therefore, that cathode rays can be reflected by a metallic surface, but there remains the question as to whether the mode of reflection is specular, like light from a polished surface such as a mirror, or diffuse, as is the case when light is reflected, say, from a sheet of white paper. In order to determine this we have constructed the tube shown in Fig. 4. Here the cathode rays from C pass through two small holes in the ends of the hollow brass cylinder, B, which also serves as anode, and then fall on the polished platinum reflector, A, which is carried by the ground-glass stopper, S, and is capable of being rotated without interfering with the vacuum in the tube. The double cylinder of brass, F G, is mounted on a curved arm supported upon another glass stopper, and is capable of rotation round the reflector. The curved arm is of glass tube, and contains a wire that connects the inner cylinder with the terminal, F^1, and it is also coated with copper, which connects the outer cylinder with G^1.

With this apparatus, with the outer cylinder connected through G^1 to earth and the inner cylinder connected through F^1 to a Kelvin quadrant electrometer, it is possible to accurately compare the amount of negative charge carried into the inner cylinder by the reflected rays for all angles both of incidence and reflection. The results show that the mode of reflection, though largely diffuse, is not altogether so, but is partially specular, and that the maximum reflection always takes place in that direction which makes the angle of reflection equal to that of incidence. Cathode rays are therefore reflected from a polished platinum surface in the same way as light is reflected from a badly-polished mirror.

Further, as will be seen later on is of importance when we come to consider the theory of the generation of Rontgen rays, it is found with this apparatus that the amount of negative charge carried by the reflected cathode rays is less, and the amount of negative charge imparted to the reflector itself is greater, the more

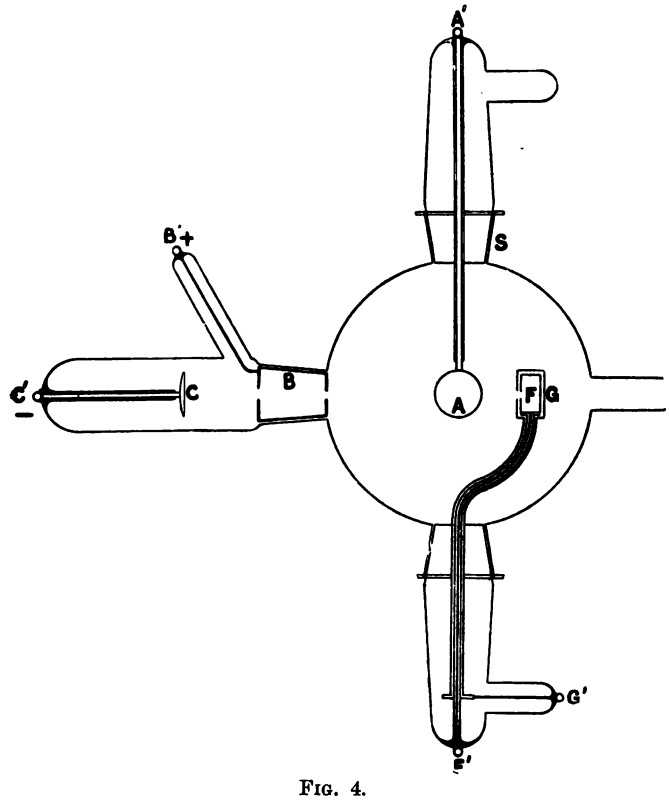


FIG. 4.

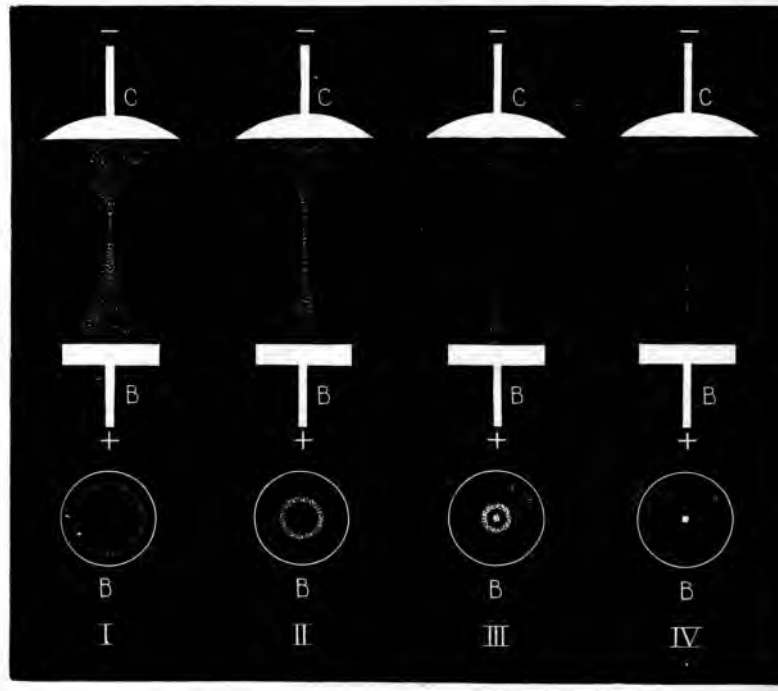


FIG. 5.

With carbon the amount of light produced by the bombardment of cathode rays, unless the latter are very intense, is but small, but if, instead of carbon, we use a disc of Thorium oxide, which is the material of which incandescent gas mantles are composed, we can obtain a very brilliant light with a comparatively small expenditure of energy. A cathode ray lamp on this principle is shown in Fig. 6. The disc of Thoria, which is prepared according to the method used by the Welsbach Company for making their mantles, is shown at M. As the lamp was designed for use with alternating currents, it is furnished with two similar electrodes, both slightly concave, C and C^1, which alternately serve as cathode and anode as the direction of the current changes. The curvature of the cathodes is so small that the beams of rays are almost parallel, so that a comparatively large ring-shaped and slightly hollow area on each side of the mantle is bombarded.

I will now turn on the current to this lamp, and, as you see, we have a very brilliant light. Under favourable conditions, we have in this way been able to obtain for short periods of time, a light of several hundreds of candle power, with an expenditure of electrical energy at some 8,000 volts pressure of less than one watt per candle, which is, of course, a much better result than is obtained with ordinary incandescent electric lamps. May be that in the future some practical form of electric lamp upon this principle may be evolved, and in any event the temperatures that can be obtained by cathode ray bombardment, which approach to those obtainable with the electric arc, seem likely to prove useful to chemists in some of their more delicate investigations.

Another property of cathode rays, besides the production of heat and of phosphorescence, is, as everyone knows, the generation of the Rontgen rays where they fall upon a solid substance. In the ordinary form of tube, adapted by Jackson to the production of Rontgen rays, the cathode rays from a concave cathode are caused to focus upon an inclined platinum plate, similarly to what is illustrated above in Fig. 2, and it is the place of impact of the cathode rays on the platinum that is the point of origin of the Rontgen rays. As is now well known, Rontgen photographs are merely the result of shadows which are cast by the object photographed upon a photographic plate, and when Rontgen ray effects are observed on a fluorescent screen the same principle is involved. Now, it is obvious that to obtain sharp effects it is necessary that the Rontgen rays should proceed as nearly as possible from a

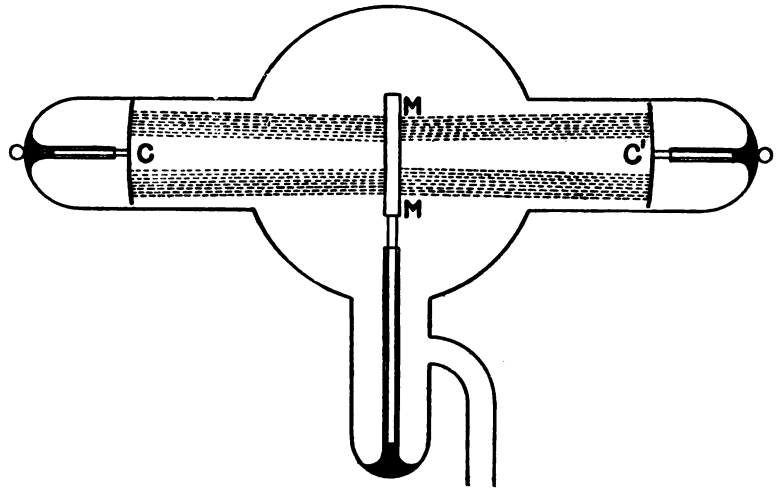


FIG. 6.

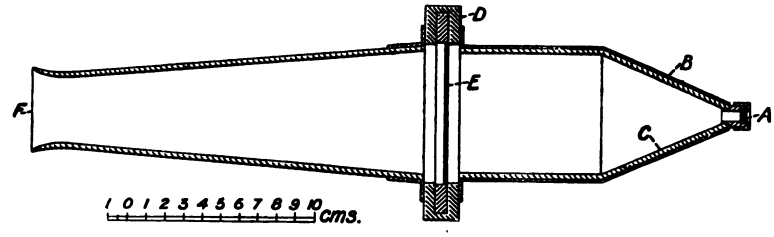


FIG. 7.

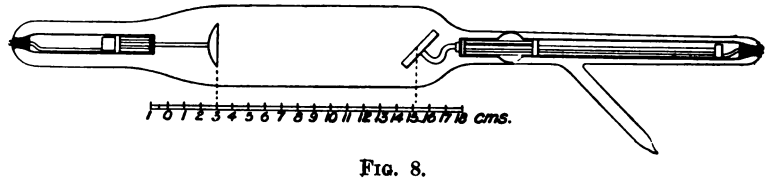


FIG. 8.

design that I have here, which is the invention of Professor Barr, no doubt this would be the best plan of getting over these difficulties. Unfortunately, however, such an arrangement is not very convenient, owing to want of portability and for other reasons. There are, however, other ways of making Rontgen ray tubes adjustable, so that rays of any desired penetrative quality can be obtained without altering the vacuum. For instance, I have here a tube which is furnished with two cathodes, one large and one small, both focussing upon the same platinum plate, or anti-cathode, as it is usually called.

I put the larger cathode into use, and, as you will see, the Rontgen rays produced will do little more than penetrate the backing of the fluorescent screen, upon which my hand throws a perfectly dark shadow with no trace of transparency. I now alter the connections and use the smaller cathode, and at once you see the rays have become very penetrative, and all the bones in my hand are easily observed. Here I have another tube with four cathodes, all of different diameters, by means of which four different degrees of penetrative quality of rays can readily be obtained. Again, I have found that regulation can be obtained by simply altering the relative positions of the electrodes within the tubes. In relation to this I must first show you a very curious thing in connection with these discharges in high vacua. As a rule, in air at ordinary atmospheric pressure, as in other media, electricity prefers to go by the shortest path. When you get to high exhaustions, however, this rule no longer applies, and the discharge often prefers to go by the longest road. In the tube shown in Fig. 8, both the cathode and the anode are arranged upon sliding stems, so that by shaking the tube, or by acting with a magnet upon a little piece of iron that is attached to each, the two electrodes can be independently moved longitudinally towards or away from one another.

To begin with, we will start with the cathode right out in that portion of the tube which is of largest diameter, that is to say, as near as it can get to the anode, and with the anode pushed back upon its stem so as to be as far away as possible from the cathode. We will now turn on the Rhumkorf coil, and, as you see, as measured by the alternative distance in air, a two-inch spark will easily pass through the tube. We will now, without moving the cathode, bring the anode nearer to the latter, so that the distance the discharge has to pass in the tube is reduced. We now find

that a two-inch spark will not pass, and that it requires a four-inch spark to do so. Similarly, if we move the anode still nearer to the cathode, we shall see that it will require a still greater electric pressure to overcome the resistance of the tube and allow the discharge to pass.

If, however, instead of moving the anode we move the cathode, we shall in this tube find that the nearer the cathode is to the anode the less is the resistance. This, as a matter of fact, would not be so were the tube of uniform diameter along that part in which the cathode can move. It is not of uniform diameter, however, but is conical, and experience shows that the smaller the annular space between the edge of the cathode and the glass the higher is the resistance. Now, with these changes of resistance in a tube of this description there occur corresponding changes in the penetrative quality of the Rontgen rays produced. When the positions of the electrodes are such that the resistance is high, it is found that the penetrative quality of the rays is great; when the resistance is low, the penetrative quality is low, and between these extremes all shades of penetrative quality can readily be obtained. This tube, therefore, indicates two methods of mechanically varying the penetrative quality of the rays. According to one the anode is made movable, when the nearer it is placed to the cathode the more penetrative are the rays. According to the other the cathode is arranged in a conical portion of the tube, and can be moved backwards and forwards along the axis of this conical portion, when the nearer the cathode is to the glass, the more penetrative are the rays. This latter arrangement is the preferable, seeing that with it very small movements give a great range, and the point of origin of the Rontgen rays is not disturbed.

Now the penetrative quality of Rontgen rays is not the same thing as their quantity. You may have a small quantity of rays that are very penetrative, or you may have rays in abundance of a description that have very low penetration. One thing that affects the quantity of the rays is the material used for the anti-cathode. Platinum, Osmium, and other metals of very high atomic weight are best. Aluminium and metals of low atomic weight are not so good. This can be shown with a tube in which the anti-cathode is made half of aluminium and half of platinum, and is movable, so that by shaking the tube either the platinum or the aluminium half can be used. Photographs taken with this

tube show that there is a considerable difference in the length of exposures required in order to produce similar results with the two metals. By suitably lengthening the exposure just as good results can be obtained with the aluminium as with the platinum, but with similar exposures the platinum gives the better results.

I now come to a recent invention which, though only incidentally connected with the subject of this lecture, is likely to prove of great importance in connection, not only with the practical applications of the Rontgen rays, but also in other ways. It is also quite new, and I have therefore thought you would be interested to hear of it.

In the experiments that I have shown this evening, I have been obtaining the necessary high tension electric currents from a Rhumkorf coil. It is not necessary to use such a coil, as high tension electric currents can be obtained in other ways. For instance, we can use a Wimshurst influence machine, and if we have one of these machines as large as that belonging to Lord Blythswood—which is, as a matter of fact, by far the largest machine of this description in the world—we can obtain remarkably fine effects. Lord Blythswood's machine, however, weighs many tons, and no large Wimshurst can be as portable as a Rhumkorf coil of equal power. The most troublesome thing about the Rhumkorf coil is the contact breaker, which is used in order to interrupt the primary current. These contact breakers are made in many forms, but all labour under the disadvantage that when you make them work very rapidly, in order to get many sparks per second, the sparks produced are very short, so that when you want long sparks you must be content with having them at a slow rate.

Only about a fortnight ago, Professor Wehnelt, of Charlottenburg, described for the first time a new form of contact breaker, which is of extreme simplicity and gives wonderful results. It consists simply of a glass vessel filled with dilute sulphuric acid, into which dip two electrodes, one a large lead plate, and the other a small platinum wire which projects only a short distance from a glass tube into which it is sealed. This is the whole apparatus. To use it you take your Rhumkorf coil, dispense with the ordinary interrupter and condenser, and simply connect the primary coil through this electrolytic cell direct on to the 100-volt Corporation supply mains. The only thing you must be sure of is to see that the platinum wire, and not the lead plate, is made the positive electrode. I will now set the apparatus to work by

closing the circuit, and, as you see, the sparks pass between the secondary terminals of the coil so rapidly that they appear like a continuous flame, while the loud hum of high pitch denotes that the frequency is extremely high. Other things being equal it is found that the exact frequency depends upon the length of the exposed platinum wire. If the wire is short the frequency is much higher than when it is long. The working of the apparatus appears to be due to the intermittent formation of a sheath of gas by electrolysis or heat around the platinum wire. The sheath, as soon as it is formed, acts as an insulator, and interrupts the current. The gas is then absorbed, and the process repeated. In this way it is possible to obtain over 1,000 interruptions per second, and at the same time to obtain long sparks.

When used with a Rontgen ray tube and the fluorescent screen, this interrupter, though rather apt to overheat the tube, gives remarkably good results, the image on the screen being wonderfully steady and brilliant. The Wehnelt interrupter is based upon experiments made by Spottiswoode and others many years ago. Like the Rontgen rays themselves, and all the other developments that I have been able to bring before you this evening, it is an instance of the scientific man having cast his bread upon the waters, and it having returned again, though after many days.

I have now to thank you for having listened so very patiently to what I fear has been a somewhat technical discourse. I have also to express my great indebtedness to Professor Barr, Dr. Magnus Maclean, and my assistant Mr. Wolff, for the loan of apparatus, and for valuable aid in preparing the experiments with which this lecture has been illustrated.

XVIII.—*The Evolution of the Blast Furnace.* By A. Humboldt Sexton, F.C.S., F.I.C., Professor of Metallurgy, Glasgow and West of Scotland Technical College.

[Read before the Society, 8th March, 1899.]

We become so familiar with the things with which we are daily brought into contact that we are apt to forget that they have a history. We see, for instance, the great blast furnaces, which are such conspicuous objects in the landscape in so many parts of the district round about us, that we almost feel that they have always been there, and are but parts of the scenery of nature. We do not realise that they are of quite recent origin, and that it is but a short time since the spots where they stand, and which are now blackened by the smoke and dust of coal and ironstone, were covered with waving corn, or were green with heather and heath.

Long before this district had risen into fame iron industries flourished in other parts of the country, from which they have long since disappeared leaving no trace behind but heaps of slag for the investigation of the metallurgical archæologist.

Within the last fifty years a great change has come over our ideas of history, political, social, and industrial, and evolution has come to be recognised as the key which will unlock many of its mysteries. The events of history are no longer regarded as mere separate facts, held together only by a slender thread, or perhaps even with no uniting bond, but as each following the other by an orderly unfolding, each being the outcome of what has gone before, and the cause of that which is to follow. The great men who seem to have left their mark upon the world are therefore of much less importance than has often been imagined; they are far more the products than the moulders of the age in which they live, and whilst no doubt our industrial arts have profited by the great discoveries and inventions that have been made, they have been brought to their present perfection far

more by the innumerable small discoveries and inventions of the unknown workers, each man adding something to that which had gone before, to be added to, in its turn by those who come after; and the function of the great discoverer or inventor is—more than anything else—to turn the stream of these small discoveries into a new channel.

Hence we can speak of the evolution of the blast furnace. It was not invented by any one man, but, from the far remote time when our ancestors first discovered the use of iron, improvements have been going on, step by step—some, of course, of much more importance than others—till as a result—as the sum of it all—the present position has been reached, and we in our turn must add our quota and pass away. The past is behind us, and we have the accumulated results of its wisdom and its folly; the present is with us now, and the future is before us and is all unknown.

Far away back in the pre-historic past our ancestors were familiar with the use of iron. No doubt, further back still, there was a time—the stone age—when men had no knowledge of metals, and supplied all their needs with tools and weapons of stone. Probably the first iron with which men came in contact was that which nature has provided—meteorites, and from these they might have forged some tools; but the supply of iron from this source was very, very small, for only the smallest of the meteorites could be worked, the larger ones being intractable in the absence of tools by which they could be cut.

Fortunately iron compounds exist in considerable abundance, which are very easily reduced. The black oxide (magnetite) occurs in some districts, and the red oxide (hæmatite) and the brown hydrated-oxide (brown hæmatite) are much more abundant. As these are very easily reduced to the metallic condition, it is easy to see, if not the certain, at any rate, the very probable, way in which the next great step was taken.

Long before the age of metals, man had discovered the use of fire; and for cooking purposes the fires seem to have been usually made in holes in the ground, surrounded in many cases, no doubt, by large stones.

The tribe, ever on the move in the search of food, came one day to a spot where red stones abounded, and with these they built up their fire. When the cooking was done, they found that the red stones had undergone a change—they had become black, and, in fact, had passed into iron; thus the smelting of iron was

discovered, and the metallurgy of iron, with all its vast latent possibilities, had commenced.

How long ago this was it is impossible to say, certainly it was before the dawn of history, for all writings on any material whatever that are known to us are far more recent than the discovery of iron, so that historical researches can only carry us back for a comparatively short distance; and, therefore, for any trace of the earliest methods of iron extraction we must fall back on the remains that have been left behind by the early workers.

Unfortunately, the remains which have been left are few and poor; traces of old furnaces have been found in many parts of the world, and many attempts have been made to prepare restorations, but with only partial success. It is, however, certain that the furnaces were very simple, consisting often only of a hole in the ground, or a short clay cylinder in which the iron ore was reduced by charcoal, blast being supplied by means of simple bellows; and as the temperature was very low, the metal was always obtained in the form which we now call malleable or wrought iron, and this was wrought into the required form by the smith, who thus became the principal artificer of the age.

Though archæological investigation has not given a large amount of information, there is another method of study by which a good deal of light is thrown on ancient methods of working. The race has, as a whole, enormously improved in its social and industrial position, but the advance has not been by any means uniform all along the line, and some men have drawn far ahead of others. Indeed, to-day, there are still races of men unacquainted with the use of metal—that is, they are still in the stone age—and others have hardly advanced beyond the early iron age. Primitive methods of iron smelting are therefore still in use—methods apparently differing but little from those which were in use many thousands of years ago.

A very good example of this is to be seen in a method of smelting carried on at Orissa, in Lower Bengal, described by Dr. Percy. The furnace is exceedingly simple, and consists of a cylinder of clay, strengthened by ribs of wood about 3 feet high, 18 inches in diameter at the bottom, and rather less at the top. In front is an opening about a foot high, which is kept closed with earth when the furnace is at work, except for a small hole through which the tuyere passes. When the charge is finally drawn, the earth stopping is removed, and the iron and infusible

material is drawn out. There is also a smaller aperture on one side, through which the slag escapes. The blowing apparatus is very simple. It consists of a short cylinder of hard wood, provided with a cover of buffalo hide, with a small hole in the centre, which is tied over the top. Through this hole a cord is passed—a piece of wood being attached on the under side so that it cannot draw out. Each furnace is provided with two cylinders, which are connected with the tuyeres by bamboo tubes. The furnace is charged with the mixture of charcoal and iron ore, an additional supply being placed on the shoot ready to be pushed into the furnace. The workman stands in front of the furnace, his feet on the bellows, holding two springy bamboo poles. He raises, say, his right foot, and allows the pole to draw up the hide cover of the cylinder, then he places his heel over the hole and presses the cover down, thus forcing the air into the furnace, at the same time lifting his foot off the other cylinder cover, and allowing it to fill with air. The cylinders are, therefore, alternately filled and emptied.

A very similar furnace was found to be in use among the natives of South Africa, and a very simple furnace, with a somewhat similar blowing arrangement, was in use in Egypt in very early times.

The form of furnace which is usually shown as an example of these early forms of furnace is that known as the Catalan forge, which is still used in the Pyrenees. It is illustrated in all the text books, and hardly needs any description. Furnaces of these very primitive types continued in use for many hundreds of years without modification. The product was malleable iron, often very steely; the output was small, and the loss of metal very considerable. The metal was obtained in "blooms," whence the furnaces were usually called bloomeries.

About the 13th century the next modification was made in Europe; this being simply the increase in the size of the bloomeries up to about 10 feet high and 2 or 3 feet in diameter. These were called high bloomeries, or, in Germany, Stückhofen, or "wolf's ovens," the mass of iron, being larger than the usual bloom, was called a wolf.

The passage from the high bloomery to the blast furnace was a very simple one. As the size of the furnace was increased, and a larger number of tuyeres were introduced, the temperature became higher, the iron was longer in contact with the charcoal, and thus

tended to take up carbon, passing first into steely iron, and ultimately into what we now call cast iron. It is likely that this was first produced as an accidental product, but its value for casting purposes would no doubt soon be recognised, and the furnaces would be built so as to produce it as a chief product. Exactly when this change was made is uncertain, but probably it was in the 13th century, and the first blast furnace of which the date is known was erected in Belgium in 1340; but it was many years before cast iron came largely into use, and nearly a century before the first blast furnace was erected in Great Britain. Once introduced, the process rapidly developed, furnaces being set up in various parts of England. The first furnace in Scotland seems to have been at Letterewe, Ross-shire, and was erected about 1607. Later, furnaces were put up at Furnace, on Loch Fyne, and at Bunawe, on Loch Etive, those at the last-named place, known as the Lorne furnaces, only having been blown out about thirty years ago.

It need hardly be said that the blast furnaces of that period were very different to those of to-day; indeed, they much more closely resembled the high bloomeries, except that, as the metal had to be tapped out in the liquid condition, a tap-hole was provided instead of the large arched opening, and the bottom of the furnace was made in the form of a cylindrical hearth to hold the molten metal. They were about 20 feet or so in height, and they were built of solid masonry, so that they were nearly as wide as they were high. The blast was supplied by leather bellows, usually driven by water power. At Cuckfield, in Sussex, where there were considerable works, the weekly output of iron was about 8 tons per furnace; and as the furnace was tapped once in twelve hours, each tapping gave 13 or 14 cwts., and three loads of coals—*i.e.*, charcoal—were used for each ton of iron.

Very little change was made in the blast furnaces till the end of the last century. The size was slightly increased, and a somewhat larger output of metal was obtained.

The iron works were all put down in localities where fuel was easily obtainable, and, as the fuel used was charcoal, the industry developed in the well-wooded districts. But the consumption of wood was very large. Each ton of iron needed for its production, say, 3 tons of charcoal, and as wood, when charred by the usual method of charring in piles, yielded only from 16 to 18 per cent. of charcoal, each ton of iron produced used up about 17 tons of wood. As a result, the wood was rapidly consumed, a wood famine was

FIG. 1.—INDIAN IRON FURNACE.

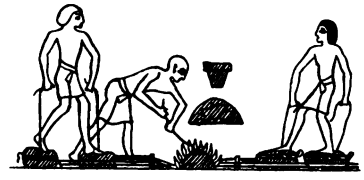


FIG. 2.—EGYPTIAN IRON SMELTING.

FIG. 3.—IDEAL VIEW OF EARLY HIGH BLOOMERY.

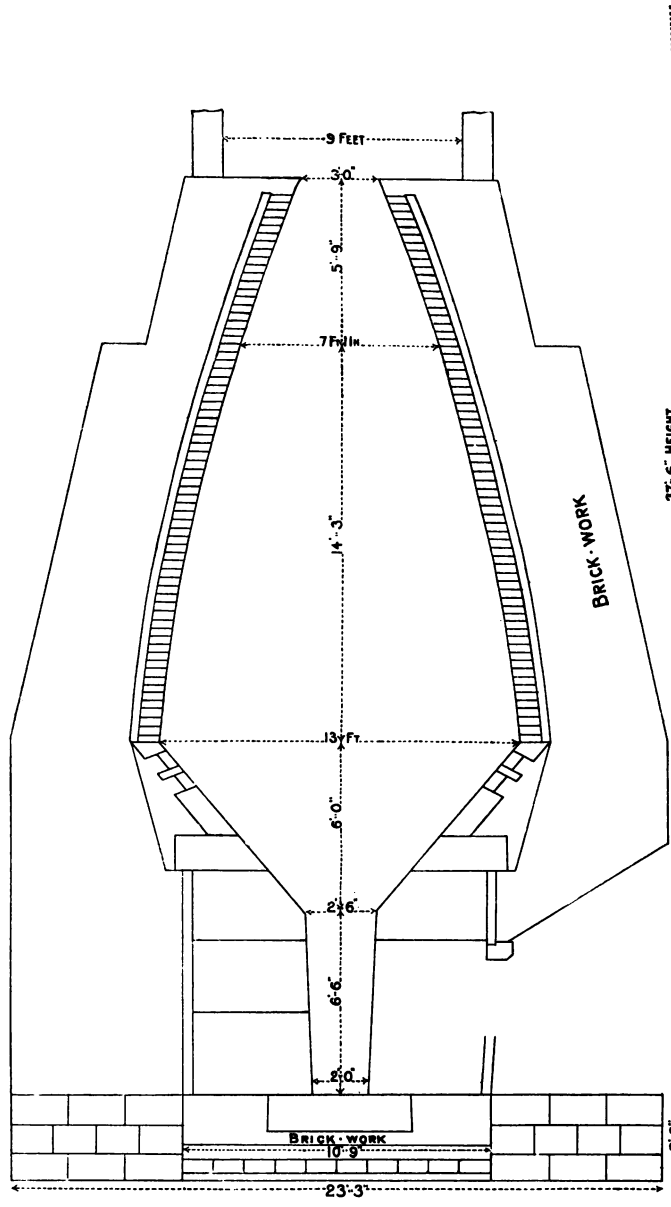


FIG. 4.—EARLY FURNACE AT CARRON WORKS.

FIG. 5.—No. 1 GARTSHERRIE FURNACE.

FIG. 6.—MODERN SCOTCH FURNACE AND STOVE.

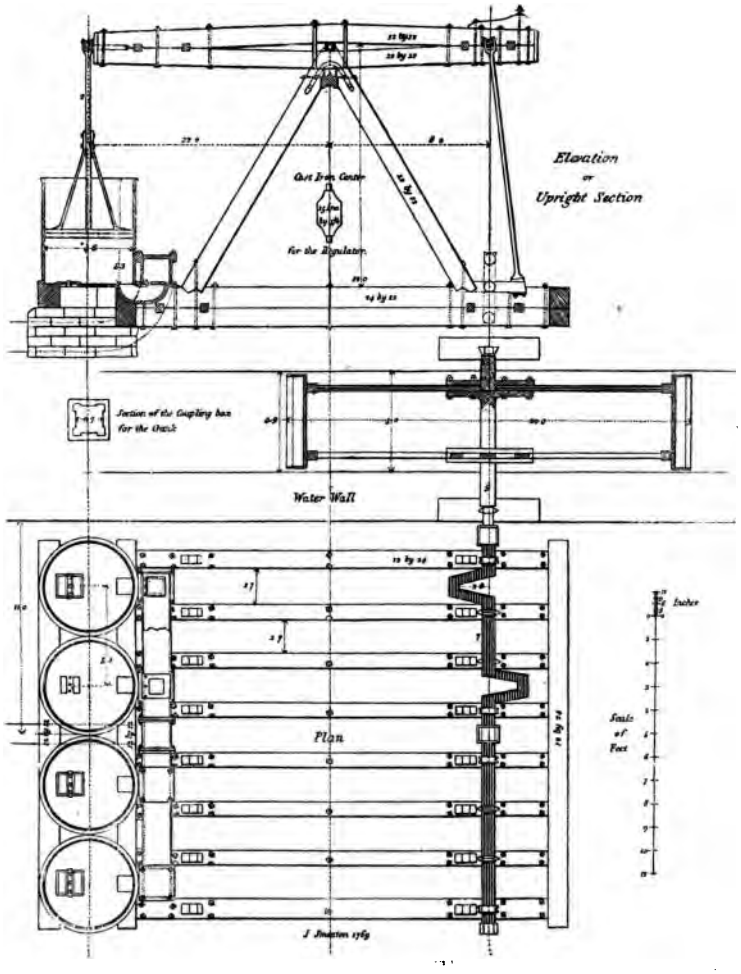
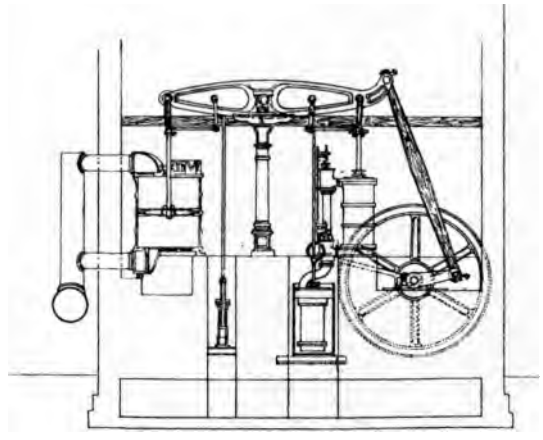


FIG. 7.—EARLY BLOWING ENGINE, CARRON.



BEAM BLOWING ENGINE
AIR CYLINDER, 96" DIA^R. STEAM CYLINDER, 44" DIA^R × 8FT STROKE
SCALE 1/2 IN 1 FOOT.

FIG. 8.

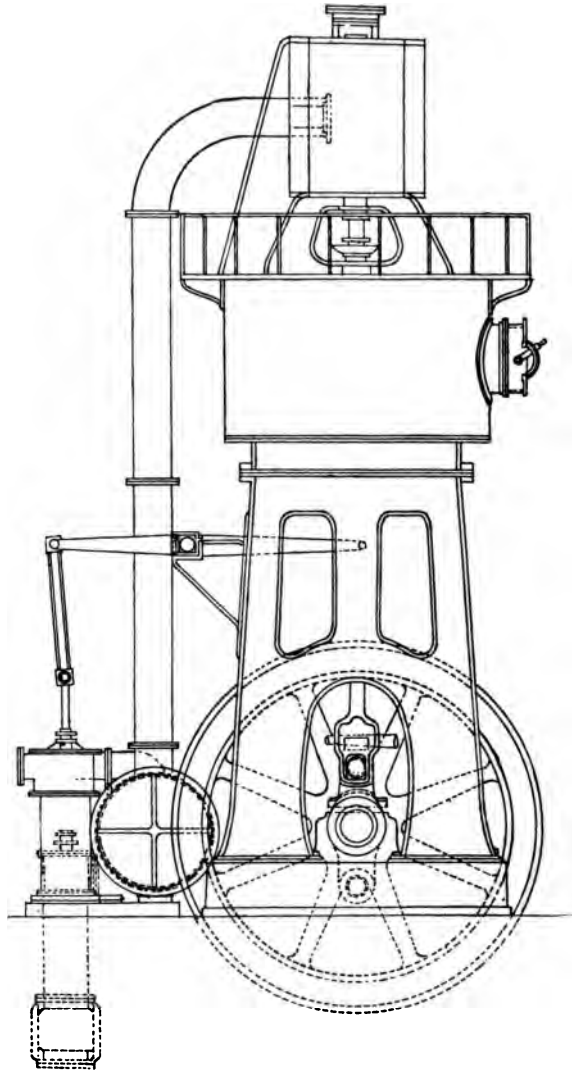


FIG. 9.—MODERN DIRECT-ACTING BLOWING ENGINE.

threatened, and it looked as if the smelting of iron would have to be abandoned. Indeed, at one time it was seriously proposed to forbid it by law. It was chiefly in England that the dearth of wood was felt, and it was the English ironmasters, therefore, who had to seek a remedy.

Coal, or pit coal, as it was then called, was slowly coming into use for general purposes, and naturally it was to that that the ironmasters turned their attention. Simon Sturtevant took out a patent for the use of pit coal in 1611, but his process was not a success. A little later, the famous Dud Dudley went to his father's works at Pensnett, in Worcestershire, where at the time, there were one blast furnace and two forges at work. He tried coal with some success, and took out a patent, but misfortune came upon him, the experiments were discontinued, and smelting with coal for a time fell into oblivion.

In 1735, Abraham Darby, of Colebrook Dale, made another attempt; he treated the coal exactly as he had previously treated wood—that is, he charred it in heaps—and produced coke. The coal he had was suitable for coking, and the problem was solved.

In 1760 the Carron Iron Works were established, the site being selected on account of the water power of the River Carron, which could be used for driving the blast. The furnaces were very small, and the blowing engines were driven by water power. Smeaton designed improved engines, and the first beam blowing engine erected by Watt is said to have been put up here. Other works soon sprung up—Cramond, Devon, Balgonie, Glenbuck, Muirkirk, Wilsontown, Calder, Clyde, and others. The Clyde works was established in 1786, and from it came two discoveries which revolutionised not only the Scotch iron industry, but that of the world. In 1801, David Mushet, who was engaged at the works, discovered that the material which the miners had called "wild coal," and had thrown away, and which looked like an impure, stony coal, was, in fact, a valuable iron ore, and, in after years, it became famous as Scotch black-band ironstone. Curiously enough, it was a long time before the ironmasters could be persuaded to take it up, and it did not come largely into use for nearly thirty years, the local clay-band ores being almost exclusively used.

The other discovery was of more far-reaching influence. Mr. James Beaumont Neilson, who in 1825 was manager of the Glasgow Gas-works, conceived the idea that economy would result from

the use of heated air in furnaces, his ideas being very carefully reasoned out. In 1825 he read a paper before this Society on "The Smelting of Iron Ore." In it he pointed out why it was that furnaces seemed to work better in winter than in summer, and refuted the idea then generally held that the colder the blast the better, and he took out a patent for the hot blast on September 1st, 1828, No. 5701. He tried experiments on forges and other furnaces with considerable success, and then he desired to try his invention on the blast furnace. He made arrangements with Messrs. Charles Mackintosh & Colin Dunlop, the proprietors of the Clyde Iron Works, and John Wilson, of Dundyvan, they taking a share in the patent rights, and the first apparatus was fitted at the Clyde Iron Works in June, 1829. The first form was very simple, consisting simply of an iron box through which the air passed, heated by a fire, and only heated the blast slightly. The results, however, were such as to encourage further experiment. The apparatus was soon much modified, and after many trials the U pipe stove was introduced by Neilson in 1832, when the method became a practical success, and almost at once revolutionised the iron industry of the country. Indeed, the modern methods of iron-smelting may be said to have commenced with Neilson's hot blast. Some of the results obtained at the Clyde are worth quoting—

			Weekly make per furnace.		Coal used per ton.		
			tons.	cwts.	tons.	cwts.	qrs.
1829, January to August,	coke, air cold,		36	10	8	1	1
1830, ,, ,,	hot air (300° F.),		54	1	5	3	1
1833, ,, ,,	,, (600° F.),		61	1	2	5	1

The experiments attracted unusual attention. Visitors came from all parts of the country and from the Continent to see what was being done, and very soon the hot blast was in use in all the more important works. Whilst the results obtained in other localities were not as striking as those obtained in Scotland, the gain was always well marked.

A small supplemental invention was, however, necessary to make success perfect. Whilst the air was sent into the furnace cold, it was sufficient to keep the iron tuyere tubes cool and prevent them from being destroyed; but, when the air was heated, this was not the case, and for a time it looked as if the process would have to be abandoned, as no material could be found for the tuyeres that would resist the furnace heat combined with the

hot air. Mr. Condie, of Calder, began experiments with the hot blast, and was subsequently transferred to the works at Wilsontown as manager, so that he might be free to carry on his experiments, and there he invented the Scotch water tuyere exactly as we have it to-day—a coil of wrought-iron pipe, through which water can circulate, embedded in a mass of cast iron, and put around the tuyere pipe, which is thus kept cool by the circulating water.

From this time onward the changes that took place were in the direction of small modifications rather than great improvements. At the time the hot blast was introduced the furnaces were small. Each new furnace was built larger than its predecessor, so as to give a larger make of iron, until, a few years ago, the maximum size was reached. The greatest advisable height depends largely on the nature of the fuel; and whilst furnaces 100 feet high are successfully run in the Middlesborough district, using hard Durham coke, with our local splint coal about 60 feet is the greatest height for good work. With increased height and increased output, the form of the furnace has been changed, the walls of the stack are reduced very much in thickness, and the whole superstructure is carried on iron columns, so as to allow free access to the bosh all round, and at the same time promote cooling; this being further accelerated in many modern furnaces by the insertion of iron cooling blocks—through which water can be made to circulate—in the masonry.

Among the minor changes which followed the introduction of the hot blast in Scotland were—1st, the use of the hitherto neglected black-band ironstone; and, 2nd, the substitution of raw splint coal for coke. This was first attempted by Messrs. Dixon at Calder in 1831, and soon became general.

With increase in the size of the furnaces more air was required, and the blowing engines underwent a marked improvement. As already remarked, the original blowers at Carron were worked by water power. Watt erected a beam blowing engine driven by steam at Carron, and another at the Clyde. The type of engine thus became fixed, and many of the engines in use to-day are of this beam type, though they are gradually being replaced by direct-acting engines, in which the steam and air cylinders are placed one above another, the pistons being attached to the same piston rod. As the air is also now used at higher pressures, a considerable number of small engines are generally being used in place of one large one.

Neilson only heated the air to a very moderate temperature, and for many years all the hot-blast stoves were modifications of his, the air being passed through iron pipes, which were heated externally by coal fires. In 1860, Mr. Cowper, of Middlesborough, suggested the use of a fire-brick stove. At first he heated it by a coal fire, but later in the same year he applied the gas from the blast furnace for the purpose. Not only did this save the coal, which had hitherto been used, but it also enabled a much higher temperature to be attained, and the furnaces, with fire-brick stoves, are now regularly run with a blast heated 1,400 F., thus producing a great saving in fuel.

In the early days all the furnaces were worked with open tops, the gas being allowed to burn to waste, illuminating the country for a great distance round. Soon after the introduction of the hot blast it was suggested to use these combustible gases, and a successful attempt was made about 1834 by Messrs. Lloyds, Foster, & Co., but it never became at all general until the introduction of fire-brick stoves for heating the blast. Now all the furnaces are worked with closed tops, and not only does the waste gas heat the blast, but it is burned under boilers, and supplies all the power required for driving the blowing engine and other machinery.

When raw coal was substituted for coke, the nature of the gas was changed. It no longer consisted only of carbon-monoxide, carbon-dioxide, and nitrogen, but carried, in addition, coal gas, tarry matters, and a small quantity of ammonia derived from the nitrogen in the coal. For years the recovery of these by-products was talked about, and in 1881 Messrs. Alexander & M'Cosh erected, at the Gartsherrie Works, the first plant for the purpose. This example has been generally followed, and now, with only one or two exceptions, all the Scottish works have a recovery plant.

The waste gas, after separation of the by-products, is not well suited for use under steam boilers, and quite recently an attempt has been made at the Wishaw Works by Mr. James Riley to abolish the boiler and use the gas direct in a gas engine.

The blast furnace, as a structure, seems to have reached finality; unless the conditions of working should undergo an entire change; but development is still taking place in the various accessories, and it still remains to perfect many details.

No doubt, the change in the immediate future will be the much larger substitution of machinery for hand labour. Casting

machines to replace the sand pig-bed, and reduce the amount of labour needed, are already in use in America, and one has been erected in England, and mechanical appliances for charging are gradually being introduced.

Scotland has always stood well to the front, and the Scotch ironmasters have originated many important improvements in plant and methods. It is to be hoped that that position will still be maintained. Difficulties are by no means objectionable, for it is only by overcoming them that progress can be made.

XIX.—*A Smallpox Hospital Experience of the Protective Influence of Vaccination.* By R S. Thomson, M.D., B.Sc., Visiting Physician, City of Glasgow Smallpox Hospital.

[Read before the Society, 4th January, 1899.]

At a time when ill-advised legislation in England is possibly preparing a way for the invasion of this country by smallpox in a widely epidemic form, it seems to me desirable that every authentic record regarding the influence of vaccination upon smallpox should be made as public as possible. It is with this object in view that I to-night bring before the members of this Society those facts which have come under my notice during the ten years I have held the position of Visiting Physician to the City of Glasgow Smallpox Hospital, Belvidere.

Before discussing such facts, it will perhaps be as well to state precisely what is claimed for vaccination by the modern advocates of the practice, and then to compare my own experience with those claims.

The modern exponents of vaccination claim that a person who has been *efficiently* vaccinated, and revaccinated in later life, is, for practical purposes, protected against smallpox. I say for practical purposes, because it must be remembered that no competent authority claims *absolute* immunity against smallpox as a result of even the most efficient vaccination. Those who are in the best position to judge are perfectly willing to admit that even the most efficient vaccination, so far as our present knowledge goes, may, on occasion, fail to confer *absolute* immunity. To insist on complete immunity in every case would suggest gross ignorance of the behaviour of smallpox itself. Second attacks of smallpox are not very infrequent; and since an individual may not be absolutely protected by a primary attack or by inoculation of the smallpox poison against a second attack of the same disease, it would be unreasonable to claim that artificially induced vaccinia or cowpox, such as results from ordinary vaccination (and which is in reality a very mild and greatly modified smallpox resulting from the transmission of true smallpox poison through several

generations of certain of the lower animals), is capable of conferring more complete immunity than the unaltered smallpox poison in its virulent form. But while, in certain exceptional instances, *complete* immunity is not conferred by even efficient vaccination, such persons as do contract smallpox under these circumstances escape with an extremely mild attack compared with which an ordinary cold is a serious illness.

So far I have dealt with efficient vaccination, I shall now say a few words regarding what I might call *inefficient* vaccination. Those who are inefficiently vaccinated possibly form the bulk of vaccinated persons, and none of these can be said to enjoy anything like complete immunity against smallpox; still, even in these, the advocates claim that such vaccination, while not completely protecting the individual, yet "modifies" the disease, so that what, apart from such inefficient vaccination, might have proved a serious and possibly fatal attack, becomes, in most instances, a comparatively mild illness.

The advocates of vaccination, while holding the opinions I have stated, admit that the protection afforded by even the most efficient vaccination does not persist indefinitely, but is slowly lost as the years go on, so that it becomes necessary, in order to secure continued immunity, to subject the individual to further vaccination. This process is known as *revaccination.* At what age revaccination should be practised it is not easy to decide, for the duration of the protection conferred by primary vaccination will depend, no doubt, largely upon individual peculiarities. For safety, however, revaccination might be practised between the ages of fifteen and twenty. My own experience leads me to believe that efficient primary vaccination will confer practical immunity up to the age of from thirty to forty years, while persons inefficiently vaccinated in infancy lose their protection much earlier.

Many persons who have enjoyed *efficient* primary vaccination seem to be insusceptible to revaccination even after many years have elapsed. This insusceptibility may be, in part, the result of other causes, yet it is noteworthy that such persons mostly present primary vaccination scars which an expert would pronounce "good." Though not directly bearing on this point, it may be stated here that apparent insusceptibility to vaccination, even though the operation may have been repeated many times, and with different samples of lymph, calf and humanised, does not

necessarily mean a complete immunity against smallpox, for such persons may contract this disease, though in a very mild form. Such an occurrence is of the greatest rarity.

Occasionally we meet with persons who seem to be completely immune both to vaccination and to smallpox. I have met with only one such person.

In the course of my remarks I have spoken of *efficient* and *inefficient* vaccination, and it may be asked what constitutes efficient and what inefficient vaccination. This is a question much more difficult to answer than appears at first sight. Strictly speaking, a person is efficiently protected only when on exposure under favourable conditions to the poison of smallpox he fails to contract the disease. It is obvious, however, that this test cannot always be applied, even if its application were advisable, and we are compelled to look for some other criterion of efficiency. Such other test of efficiency, however, is not in the meantime available, and could only be made possible by legislation compelling a second vaccination of all infants within a few months of the performance of the primary operation, when, if insusceptibility to revaccination was proved after sufficient trial, we might regard the original vaccination as efficient. In my experience very many children who have been certified as "successfully vaccinated" are susceptible to revaccination before the completion of their second year. Such children have not been *efficiently* vaccinated, and have not had that degree of immunity to smallpox conferred upon them which is the object of legislation. This inefficiency is sometimes the result of a compromise on the part of the vaccinator to meet the views of the child's guardian.

This second test, however, is not more available in practice than the former; and, consequently, though a child is vaccinated, we are in no certainty that the vaccination is *efficient*, though it may be *successful*. These two terms, as is obvious, do not necessarily mean the same thing. We carry out our vaccinations, therefore, by "rule of thumb," and by vaccinating over a considerable area try to saturate the child with the disease, trusting in a general way that our operation, if successful, will likewise prove efficient.

We are in a better position to judge of the efficiency of our operation, however, after the "pock" has completely healed, and the characters of the "scar" are evident. We then observe the appearance of the scarred surface, and note whether it is pitted

or "foveated" in whole or in part, and upon this and the size of the scar, we base our opinion as to the protective value of the vaccination. Speaking broadly, it may be said that the larger the "scar area," whether that area consists of a single, continuous scar, or several smaller scars, and the greater the proportion of that "scar area" which is "foveated" or pitted, the greater the efficiency of the vaccination. Gauged by this standard it will be obvious we may have in the scar indications of all grades of efficiency, from zero upwards.

The way having now been cleared by the above general statements as to the claims put forward in favour of vaccination, I shall proceed to state the results of my experience in the City of Glasgow Smallpox Hospital, and shall attempt to discover whether these claims are borne out by that experience.

The questions to be answered are—

1. Does vaccination, in its broadest sense, protect against smallpox irrespective of its complete efficiency, and what is the protective influence of revaccination?

I would here emphasize the word "protect," and point out that this means not only complete protection against the disease, but also "comparative" protection; or, in other words, that a vaccinated person, while he may contract smallpox, yet is protected against a severe attack, and against the serious results of the disease, such as severe scarring of the face, loss of sight, etc.

2. What degree of protection is indicated by the "scar area," and the character of the scar?

3. How long can we safely rely upon the protection afforded by a moderately efficient vaccination, such as we find in most members of the community?

We will now proceed to discuss these three questions in order.

It is usual when studying the influence of vaccination upon smallpox to examine, in the first place, its modifying influence, as seen in those who have contracted smallpox, as well as its absolutely protective influence seen amongst those who, though coming into intimate contact with persons and clothing infected by smallpox, yet, as a result of efficient vaccination, escape infection.

It is customary when classifying persons who have contracted smallpox—with a view to estimating the influence of vaccination—to divide these into three groups:—(1) those who have been successfully vaccinated (the degree of success of the operation

being gauged by the appearance of the familiar scar on the arm or elsewhere); (2) those on whom the evidence of vaccination is not considered satisfactory, owing to an absence of the scar, or owing to the scar having been obliterated or masked by an abundant eruption. In all such "*doubtful*" cases the person is *said* to have been vaccinated in childhood. (3) Those who have avowedly *never* been vaccinated, either from carelessness and neglect, lack of opportunity, or, as is sometimes the case, from a rooted aversion to the operation itself. These three classes are generally called *vaccinated, doubtful, unvaccinated.*

During the last 10 years there have passed through the Smallpox Hospital at Belvidere 797 cases of smallpox. Of this number 709 were *vaccinated*, 21 *doubtful*, and 67 *unvaccinated.* To estimate the influence of vaccination in these three groups we must answer the following questions:—(1) What was the *death-rate* in each? (2) what influence, if any, did vaccination have upon the *severity* of the attack? (3) what period of residence in hospital was necessary in these different classes? These points can be best appreciated when presented in tabular form.

TABLE SHOWING RELATIVE DEATH-RATE IN VACCINATED, DOUBTFUL, AND UNVACCINATED CASES.

Condition as to Vaccination.	No. of Cases.	Deaths.	Per Cent.
Vaccinated, - - - -	709	25	3·52
Doubtful, - - - -	21	6	28·57
Unvaccinated, - - -	67	31	46·30

A comparison of the percentages shown in this table is most instructive. The numbers are not large, but, so far as they go, they show the immense advantage a vaccinated person enjoys over an unvaccinated as regards the probability of recovery. There is no doubt that some of the cases classed as doubtful have really been vaccinated, though the evidence of this has been obscured by an abundant eruption at the seat of operation. It must be borne in mind that this table includes vaccinations of all degrees of efficiency, or rather inefficiency, and represents many persons in whom any protection originally conferred by vaccination had been much weakened through lapse of time.

But death is not the only misfortune attendant upon smallpox.

All kinds of deformity, blindness, deafness, unsightly scarring, and other disabling changes may result. These are in direct proportion to the *severity* of the attack, and, consequently, a study of this point will enable us to gauge the influence of vaccination in "modifying" the attack. The severity of an attack of smallpox is best gauged by the amount and character of the eruption, hence, for statistical purposes, we are in the habit of classing all cases as *discrete*, *confluent*, and *hæmorrhagic*. This classification is based upon the amount and character of the rash present on the face. In *discrete* cases the pustules or pocks are quite separate on the face, and the attack is more or less mild according to the number of pocks on a given area of skin; in *confluent* cases the pustules or pocks run together, so that often the patient's features become unrecognisable (such cases are always very severe); in *hæmorrhagic* cases the eruption is very abundant, or it may be badly developed, but in either case the eruption is associated with bleeding into the skin and often into other tissues of the body. These cases are *malignant*, and recovery is very rare indeed. The following table will show at a glance the influence of vaccination upon the *severity* of the attack:—

TABLE SHOWING SEVERITY OF ATTACK IN VACCINATED AND UNVACCINATED CASES.

Nature of Case as to Vaccination.	Discrete.		Confluent.		Hæmorrhagic.	
Vaccinated, - - - -	674	95 %	29	4 %	6	1 %
Unvaccinated, - - -	13	20 %	45	67 %	9	13 %

From these figures, dealing with the *severity* of the attack, it will be seen that an unvaccinated person is much more likely than one who has been vaccinated to suffer from an attack in itself most severe and loathsome; and not only so, but he is also more likely to suffer from the serious complications and disfigurements commonly associated with severe forms of smallpox, even if he should escape with his life.

Another test of the influence of vaccination on smallpox is to be found in the period of detention in hospital. Cases of smallpox are detained in the wards till all crusts have separated and the patient is "skin whole," but a minimum period of 28 days from the onset of the attack is insisted on even in the mildest cases, though many of these mild cases may have had only one or two pocks.

Comparing this period of detention in the three classes of cases we find that the unvaccinated had again to suffer most—

Unvaccinated	detained	an average of	60 days.
Doubtful	,,	,,	51 ,,
Vaccinated	,,	,,	38 ,,

It seems to be clear, therefore, that the unvaccinated person is the most unfortunate of the three classes, for not only does he run more risk of dying, but, if he recovers, he is more likely to be permanently disabled, and his business relations suffer more. He is also, it must be remarked, a source of greater expense to the community.

So far I have dealt with the influence of vaccination as studied in those who are *imperfectly* protected by *inefficient* vaccination. I shall now proceed to consider the influence of the operation upon smallpox among those who have been protected by *efficient* vaccination and revaccination.

It is my custom to regard the whole precincts of the Smallpox Hospital as an infected area, and, as a consequence, no person who is not, in my opinion, efficiently protected is admitted within the walls. Nurses and other employees must have been successfully revaccinated *before* taking duty in the hospital, or they must show evidence of insusceptibility by failure of a thrice repeated attempt to vaccinate, generally with different samples of lymph. Students and medical practitioners who visit the wards are likewise compelled to show evidence of recent successful revaccination, or of insusceptibility to revaccination as gauged from a failure to "take" after repeated trials. Patients admitted to hospital suffering from diseases other than smallpox are revaccinated on admission, and the operation repeated on alternate days till either the revaccination "takes" or the patient is considered insusceptible. Every employee, and visitor or patient, is treated in this way, altogether irrespective of the state of former vaccinal scars.

During the period under consideration, besides smallpox patients, 595 persons entered the hospital who were regarded as immune. Of these, 99 were officials of the institution, and 226 were persons suffering from diseases other than smallpox. These came into intimate contact with the smallpox patients, or with their infected clothing, and were consequently exposed to every risk of contracting the disease. The remaining 270 persons were medical students and practitioners who attended the demonstration of cases given in the hospital. These 595 persons were

regarded as "immune" as a result of recent successful revaccination, or failure to revaccinate after repeated trials. *Not one of those who had been successfully revaccinated contracted smallpox.* In addition to the persons enumerated, 4 who had been vaccinated in *infancy only* entered the hospital against orders, and all contracted the disease. These results are very striking, and almost fulfil the conditions of scientific experiment. That failure to revaccinate is not evidence of *complete* protection is shown by the fact that of the 595 persons just referred to, two who had failed to revaccinate after several trials contracted the disease. In both, the attack was of the mildest description. In addition, a visitor who contracted the disease had been revaccinated, but the operation had taken place *twenty* years prior to exposure to infection.

All that has been said so far concerning the condition as to vaccination of those who were admitted to hospital while suffering from smallpox refers to vaccination of all degrees of inefficiency and at all ages. With this fact before us, we must now consider whether there is any evidence to show that in some the vaccination had been originally less inefficient than in others. We will now, therefore, try to find an answer to our second question—viz., what degree of protection is indicated by the "scar area," and the character of the scar?

As already stated, the degree of inefficiency can, to some extent, be estimated by the *appearance* of the vaccinal scars. The *foveated* or pitted scars are generally regarded as indicative of greater efficiency and consequently of greater protective value, than those which are either not foveated at all or only partly so. The relative value is shown in the accompanying table, in which the figures refer to all ages.

TABLE SHOWING INFLUENCE OF VACCINATION ON SEVERITY OF ATTACK AND DEATH-RATE WHEN SCARS ARE "FOVEATED" AND "UNFOVEATED."

	FOVEATED.				NON-FOVEATED.			
Character of Attack in 709 Vaccinated Persons.	Discrete.	Confluent.	Hæmorrhagic.	Deaths.	Discrete.	Confluent.	Hæmorrhagic.	Deaths.
	523	16	1	9	125	14	5	16
Per Cent., - -	97·0	2·8	0·2	1·6	86·8	9·7	3·5	11·1

Up to this point, in considering the influence of vaccination upon smallpox, the question has been dealt with from the widest point of view, and so far the evidence would seem to indicate that *every* person who has been vaccinated enjoys a certain amount of immunity, and that persons vaccinated successfully a second time within a reasonable time before exposure to the infection enjoy practically *complete* immunity. Taking only those persons who contracted smallpox after a single vaccination in early life, it comes to be a question whether we are able, by an analysis of the vaccination scar, to measure the degree of protection afforded by the original vaccination. A glance at the above table dealing with the character of the scar will furnish a ready answer, and will show clearly that a person with *foveated* scars enjoys a greater degree of protection than a person whose scars are not *foveated.* Among 709 vaccinated persons, 565 possessed *foveated* and 144 *non-foveated* scars. Of the former, 97 per cent. were "discrete," *i.e.*, moderately mild cases, while of the latter only 86·8 per cent. were of this comparatively mild type. Turning to the similar cases in each group, we find there were only 2·8 per cent. of "confluent" and 0·2 per cent. of "hæmorrhagic" cases among the *foveated* cases, while among the *non-foveated* these forms of the disease occurred in 9·7 per cent. and 3·5 per cent. of the total number. The death-rate in these two classes is very striking, being only 1·6 per cent. in the first group, while it rose to 11·1 per cent. in the second.

It will be clear from what has been said then that, while vaccination affords a certain amount of protection against smallpox, the more *efficient* the vaccination, as determined by the presence or absence of a *foveated* condition of the scars, the greater will that protection be.

While the statistics just given indicate that the character of the scar is, to a certain extent, a measure of the protection enjoyed by vaccinated persons, yet this test is available only after the scar has completely formed, a process not completed till a very considerable time has elapsed from the date of vaccination. Hence arises the question as to whether there is any test available which might be applied at the time of vaccination.

The only test which can be applied at the time of operation is that which depends upon the question whether the extent of surface vaccinated can in any way influence the degree of protection conferred. As the scar area and the number of scars are

approximately a measure of the area operated upon, an enquiry into the influence of *scar area* and number of scars will furnish us with an answer to the question.

It will be readily understood that the *number* of scars affords but a rough estimate of the efficiency of vaccination, seeing that each scar may be infinitely small or relatively large, yet even that rough method of measuring efficiency seems to furnish us with some guidance. This fact will be readily understood from a study of the following table, in which the cases are classed according to the *number* of scars :—

Number of Scars.		Discrete.	Confluent and Hæmorrhagic.	Deaths.
Class I., One Scar, - -		314	22	18
Class II., Two Scars, - -		285	9	4
Class III., Three Scars, - -		75	4	3
Totals, - - -		674	35	25
Result in percentages of total cases in each class,	Class I.,	93·5	6·5	5·4
	Class II.,	97·0	3·0	1·4
	Class III.,	95·0	5·0	3·8

From this table it would appear that a person with *two* scars is decidedly better protected than a person with three, and it was a consciousness of the impossibility of founding accurate deductions upon so unscientific a foundation as that afforded by a study of the *number* of scars which led to the introduction of a tolerably accurate method of measuring the superficial area of the scars, and calculating this *scar area* in fractions of a square inch. The details of this method it is unnecessary to give here; suffice it to say that the results are accurate when the method is properly carried out, and admits of a comparison of the results of different observers. The importance of this method may be gathered from the accompanying table, in which the cases are divided into three classes. In the first are included all scars with an area under $\frac{1}{4}$ square inch; in the second class are included all scars measuring $\frac{1}{4}$ to $\frac{1}{2}$ square inch; while to Class III. are relegated all scars having an area over $\frac{1}{2}$ square inch.

Area of Scar.		Discrete.	Confluent and Hæmorrhagic.	Deaths.
Under ¼ Square Inch, - -		69	13	12
¼—½ Square Inch, - - -		173	11	6
Over ½ Square Inch, - -		431	12	7
Results in percentages of total cases in each class,	Class I.,	84·1	15·9	14·6
	Class II.,	94·0	6·0	3·3
	Class III.,	97·0	3·0	1·6

Though the results based upon the *number* of scars are unsatisfactory for the reasons stated above, those obtained by a careful estimation of the *scar area* are of great value. In this table the steady increase in the percentage of mild cases, coincident with an increase in the scar area, is very striking; but even more so is the fall in the proportion of severe cases from practically 16 to 3 per cent., while the death-rate declines in even a more remarkable manner, falling, as it does, from 14 to 1 per cent.

From this table we are able to deduce a conclusion of practical utility, namely, that when the operation of vaccination is performed we should aim at operating upon a considerable surface. If vaccination is carried out in a perfunctory manner, the child is not efficiently protected; hence, in performing the operation, our aim must be to procure as high a degree of immunity as possible by producing a large "scar area," which should be as much "foveated" as possible. This last condition is probably best secured by carrying out the operation itself with careful antiseptic precautions, and protecting the part from injury till scarring is complete.

This brings us to our third question, viz., how long can we safely rely upon the protection afforded by a moderately-efficient primary vaccination, such as we find in most members of the community?

To answer the question we must endeavour to discover at what age, as gathered from statistical evidence, the protection afforded by vaccination begins to decline. This question is not so easy to answer as might appear at first sight, for it is complicated not only by the fact that in smallpox patients we have to deal with vaccinations of all degrees of efficiency, but also by the

fact that certain persons are naturally more susceptible to the disease than others; still, a comparison of the death-rate and of the character of the attack at different age-periods furnishes us with information accurate enough for practical purposes. We shall make a survey of the conditions at different age-periods, as set forth in the following table :—

Age.	Discrete.	Confluent.	Hæmorrhagic.	Deaths.	
0—5	11	...	...	...	...
5—10	11	1	...	...	...
10—15	56	1	...	...	...
15—20	115	1	...	...	...
20—30	276	10	2	11	3·8 %
30—40	149	10	5	8	5 %
40 and upwards,	55	6	...	6	9·9 %

This table deals with all cases irrespective of the character of the scar or the extent of the scar area, yet it brings out several points of great importance, and enables us to frame a reply to the question we have just set ourselves to answer. Perhaps the most striking fact brought out is that *no vaccinated person died under the age of twenty.* After that age there is a steady rise in the death-rate, though even in the latest age-period the rate of mortality compares very favourably with the rate among unvaccinated persons and among those in whom vaccination is doubtful. But not only are there no deaths under twenty, but there is also a striking absence of severe cases, which scarcely present themselves at all during the first four age-periods, though after the fourth period the proportion of severe cases is greatly increased, being about 4 per cent., 9 per cent., and 9·8 per cent. respectively in the successive periods after the fourth.

Another fact brought out prominently is the small proportion of children under ten years of age affected by the disease, only 23 out of 709 cases being in children under ten. This is the opposite of what we find among unvaccinated persons. Among these the proportion of children attacked is large as compared with adults. It is clear then, from what has been said, that among vaccinated

persons the susceptibility to the poison of smallpox becomes more marked during the fourth quinquennial age-period, though it does not become decided till after 20 years. It is this fact which has led to the recommendation that revaccination should be practised at 15 years or thereabout.

Summary.—I have intentionally refrained from making my communication too technical, and have avoided as much as possible giving intricate statistics, yet the evidence I have brought before this meeting, though based upon a limited group of cases, shows that, firstly, vaccination resulting in the formation of even a small scar would appear to afford very decided protection against smallpox; secondly, that vaccination resulting in the formation of a moderately large foveated scar affords protection in a very high degree, even though that protection may not be complete; thirdly, successful and efficient vaccination affords practically complete immunity for many years; fourthly, protection afforded by primary vaccination is gradually weakened by lapse of time, and continued protection can be secured only by revaccination; fifthly, it is important that the difference between successful and efficient vaccination should be clearly borne in mind. The former means merely that a local reaction has resulted from the operation, but it does not necessarily follow that the protection afforded thereby is of the highest possible grade.

XX.—*Abstract of Paper on "The Communication of Infection by Flies."* By W. A. M'LACHLAN, M.D., Dumbarton.

[Read before the Society, 1st February, 1899.]

THE author, in the first place, gave a short description of the development, structure, and growth of the house fly, referring specially to the structure of its mouth and digestive organs, the nature of its food, and the formation of its feet. He then described its habits of life, including its periods of activity, lethargy, and hybernation. He stated that these bore a definite relation to the rise, progress, and fall of the yearly cycle of typhoid fever, illustrating his statements by a series of diagrams which showed that the beginning, rise, continuation, and decline of fever, extending over a period of twenty-five years, were coincident, making due allowance for the period of incubation, with the active period of fly life.

The author then referred to a number of experiments carried on by himself in which the common house fly was brought immediately into contact with the ejecta and blood of typhoid patients, and afterwards incarcerated in bell jars. The latter had free communication with other jars in which were sterilised potatoes and gelatine. He then recorded the results of these experiments, and the finding of the bacillus of typhoid in the cultivation media.

The author was uncertain as to whether the manner of communication between the fly and the sterilised media was by the feet of the fly, or by the food passing through its alimentary canal, or whether the communication was effected in both of these ways. He was of opinion that many forms of the exenthemata were conveyed from host to host by flies and other forms of insects, and stated that he was strongly confirmed in this opinion by some cases of smallpox which he had seen.

Report by John Mann, Treasurer, on the Position of the Trust constituted for the purpose of establishing the Graham Lecture and Medal Fund, 1st December, 1898.

(Printed by order of the Council.)

The sources of information available to the reporter have been the following:—

(1) Minute Book of the Chemical Section of the Society, ranging from 4th October, 1880, till the Section went into abeyance.

(2) The Cash Book of the Section, from 1868 till the end.

(3) The Minutes of the Philosophical Society, as printed in the Billets calling the meetings.

It has been thought better to present at the outset excerpts from these as follows:—

(1) *Society Minute, 4th December, 1878.*—A communication from the President and Council of the Chemical Section was made by Mr. J. J. Coleman. Mr. Coleman stated that the Chemical Section some time ago had under their consideration the propriety of raising a fund for the encouragement of research. . . . Some difference of opinion had arisen as to whether the money should be invested for the purpose of endowing lectures, or the awarding of medals for original research. It was eventually agreed that two-thirds of the fund should be appropriated for lecture purposes and one-third for medal purposes, and that one triennial lecture should be also designated as "The Graham Lecture." . . . . The Council intended to award their medal at not less intervals than three years. . . . . The Capital Fund would then be transferred to Trustees under the guidance of Professor Roberton, the interest thereafter being annually applied for the purposes of the Trust by a Committee, consisting of the President of the Philosophical Society and the Officers of the Chemical Section, who would arrange for as many lectures as the fund would permit of.

(2) *Printed Report to the Council of the Chemical Section of the Philosophical Society, dated 28th March, 1878.*—There seem to have been two editions of this print, but without material difference. One edition has this footnote: "The Committee have been guided in drawing up this report by Professor Roberton, who has kindly consented to amplify it into a Trust Deed upon its

being adopted by the Society." This print has seven headings, the first being: "The fund is to be placed in the hands of, say, three Trustees, two to be chosen from the subscribers to the fund, and one from the governing body of the Philosophical Society. These Trustees to be nominated and elected, to begin with, by the Chemical Section of the Philosophical Society, [and to be members of the Philosophical Society during the term of their trusteeship."]* Headings 2 to 6 are devoted to details of appointments, fees, &c. Heading 7 has the following: "The Executive Committee for carrying out the objects of this Trust to be the President of the Philosophical Society, with the Officers for the time being of the Chemical Section thereof, whether elected as at present, or in any other way which may be convenient to the Society. . . . .

(3) *Minute of the Chemical Section, Graham Medal and Lecture Fund Committee, 1st November, 1883.*—Mr. Coleman also stated: "Dr. Roberton regrets that he has not drawn up the Trust Deed earlier, but promises to do so at an early date."

(4) *Minute of Council of the Chemical Section, 9th February, 1885.*—The President (J. J. Coleman) was authorised to transfer the money held by him as Treasurer to the Graham Medal and Lecture Fund to the Council of the Philosophical Society of Glasgow, on the understanding that the Society will act as Trustees of the fund in place of the three Trustees named in Rule 1 of the Regulations for the administration of the fund agreed to by the Chemical Section in Session 1878-79, a printed copy of which is hereto annexed. (No print is annexed to this minute, but it is presumed to be one of those mentioned above and quoted from.)

(5) *Minute of Council of the Philosophical Society, 4th March, 1885.*—On the motion of Mr. J. J. Coleman, it was agreed that the Council act as Trustees of the Graham Medal Fund, and it was remitted to Mr. Coleman and Mr. John Mann to take the necessary steps for receiving and investing the money of the Graham Medal Fund in the name of the Council, and to report their action at next meeting.

(6) *Receipt granted by John Mann, as Treasurer of the Philosophical Society, dated 25th March, 1885.*—This bears to be on

* Omitted in the other version.

behalf of the Council of the Society, acknowledging receipt from Joseph James Coleman, as President of the Chemical Section of the said Society, of a certificate for £250 of the 4 per cent. Preference Stock of the Glasgow and South-Western Railway Company, dated 30th May, 1881, standing in name of the said Joseph James Coleman, as Treasurer of the Thomas Graham Medal and Lecture Fund in trust, along with a transfer of said stock, executed by him of this date, in favour of the Philosophical Society of Glasgow, No. 207 Bath Street, Incorporated, in trust for the Thomas Graham Medal and Lecture Fund; and goes on: "and the said investment has been so received by me in order that the said Society may act as Trustees for the fund, in place of the three Trustees mentioned in Recommendation No. 1 of the Code of Rules for the administration of the fund, agreed to by the Council of the Chemical Section, and adopted at a General Meeting of said Section held 8th April, 1878, and afterwards approved by the Council of the Philosophical Society, said arrangement for the alteration of the holders of the Trust having been duly sanctioned by meeting of the Chemical Section held on 9th February, 1885."

(7) *Minute of Chemical Section, dated 9th November, 1886.*—The President reported that he had transferred to the Council of the Philosophical Society the funds of the Graham Medal and Lecture Fund, amounting to £250, and that the Council had accepted of the position of Trustees. He also reported that the money had been invested in the name of the Philosophical Society, 207 Bath Street, the interest accruing therefrom to be annually payable to the Treasurer of the Chemical Section for administration as per Rules of fund decided on in Session 1878-79.

The foregoing excerpts are all that can be gleaned as to the constitution of the Trust. Dr. Roberton died in 1889. The reporter has made inquiry at his firm, and has been afforded every facility in his endeavour to trace the existence of the Trust Deed referred to. No trace of it can be got in Dr. Roberton's office as ever having been prepared. The book-keeper there remarked that it might have been a gratuitous piece of work which would not pass through the office books, and that the document and all trace of it might have been handed over to some one of those interested.

Mr. R. R. Tatlock, who was Secretary of the Chemical Section for some time, has been applied to, and writes that he was under

the impression that Messrs. Roberton made out the deed, for which they made no charge.

Mr. John Tatlock, who was Secretary of the Chemical Section at a later period, and its last Secretary before it fell into abeyance, referred to the Minute Book of the Section, which he handed over to the Secretary (Dr. Fergus) of the Philosophical Society some time ago. That book has been obtained and utilised, being No. 1 of the sources of information. Mr. Tatlock cannot remember having ever seen the Trust Deed itself, and knows nothing beyond what the minutes might reveal.

The conclusion the reporter has come to from the foregoing investigations is that no Trust Deed was ever actually written out or even drafted, and that, therefore, the intention of the founders of the fund must be held to be the conditions of the printed report above referred to.

It will remain to be considered, with or without getting proper legal advice, whether a Trust Deed should now be prepared, in order to be recorded in full in the Society's Minute Books, or in any of the public records.

All which is humbly reported by

JNO. MANN, C.A.

137 WEST GEORGE STREET,
GLASGOW, 1*st December*, 1898.

THE LATE PROFESSOR JOSEPH COATS, M.D.

AFTER the loving tributes that have been paid to the memory of Professor Coats by Sir William Gairdner,[1] Dr. Lindsay Steven,[2] and Dr. Donald Fraser,[2] it might appear scarcely necessary to add here any further account of his life and work. Yet it is only fitting that this Society should take note that it lost one of the ablest and noblest of its members when Dr. Coats passed away on the 24th of January last. He was elected a member on the 19th November, 1873, during the presidency of Professor Grant, LL.D., and among others who were elected on the same occasion were Dr. J. Ewan Brodie, Mr. D. C. M'Vail, and the late Dr. Ebenezer Watson. He became a life member in 1889. In November,

[1] *British Medical Journal*, 4th February, 1899.
[2] *Glasgow Medical Journal*, February, 1899.

1890, he was elected a member of Council for three years, and at the end of that period he became vice-president for other three years. In addition to the part he took in discussions at the meetings of this Society, he contributed papers on three important subjects. On the 21st March, 1877, he read a communication "On Some Recent Views of the Functions of the Brain and its Relation to other Nervous Centres."[1] On the 13th April, 1892, he read a paper on "Sleep, Dreams, and Delirium." This was not printed in the *Proceedings* of the Society, but it appeared in the *Glasgow Medical Journal* for October of the same year. It contained an interesting letter from Professor Gairdner, giving an account of his delirium in typhus fever in 1844. The third paper was read on the 20th November, 1895, when he was vice-president, and was entitled "Immunity to Infective Diseases: a Pathological Study in view of Recent Researches."[2]

But though Dr. Coats did good service as an office-bearer and member of the Society, the life work that he had accepted as his own led him to concentrate his energies in another field. In the scientific world to which he belonged he was best known as a pathologist, and, above all, as a teacher of pathology. His "Manual of Pathology" is one of the best existing treatises on the subject, and the wide-spread character of its reputation is shown by the fact that of the last edition, published some three years ago, and already exhausted, two-fifths went to America. This, however, is but one of the very numerous contributions from his pen to the medical literature of recent years.[3]

While his writings did much to spread his personal reputation, and thus indirectly throw lustre on the school to which he belonged, the supreme debt of gratitude which the city and Medical School of Glasgow owe him is due on account of his successful efforts to establish the scientific teaching of his favourite subject on a satisfactory basis. He set himself to this work early in his career, and provided instruction of the highest order for those who studied under him. He became University Lecturer on Pathology, and in course of time had practically all the duties of a professor to discharge, though without the corresponding

[1] *Proceedings* of this Society, 1877, Vol. X., No. 2, pp. 348-365.

[2] *Proceedings* of this Society, 1896, Vol. XXVII., pp. 20-38.

[3] A list of the principal writings of the late Professor Coats, compiled by the writer of this notice, appeared in the *Glasgow Medical Journal* for April, 1899.

status, honour, or remuneration. And very soon after these advantages had at length become his—after he had been teaching for about a quarter of a century—the early symptoms of his fatal malady began to show themselves.

Another excellent piece of work that Dr. Coats did for his school and profession was to conduct the *Glasgow Medical Journal* as its editor or joint-editor during the long period of twenty-one years. Like many another scientific periodical, the *Journal* has come through troublous times—a fact attested in library catalogues by the numerous series through which such publications run. Our *Journal* is now in its fifth series. The first began in 1828 and contained five volumes. The second had only one. It was nearly twenty years afterwards that a start was made with the third, which produced thirteen volumes. The fourth series had two. The fifth began in 1868, and is now in its fifty-first volume, with a reputation already long established—for the *Journal* is read and quoted in America and on the Continent—and with a position of financial stability it has never known before. This is largely due to the fostering care of Dr. Coats, and while the importance of his services as editor has been in great measure recognised, it is doubtful if many, even of those who now take a share in the management of the *Journal*, are aware that until a few years ago the commercial arrangements as to the advertisements, with all their multitude of petty, time-consuming details and worries, were undertaken by the senior editor.

Probably no teacher could be freer from the suspicion of partiality among his students than Professor Coats was, and we have evidence of the respect and favour in which he was held in the fact that year after year they elected him Vice-President of their Representative Council. He was chosen for this honour from the first, and as a past student of the University he was not eligible for the office of president. Dr. Coats was the founder of the University Club in this city, and many will remember the important speech he made in the Bute Hall in January, 1893, when presenting Professor Gairdner with the portrait subscribed for by hundreds of his old pupils.

Much of his work must remain unnoticed here, but in public or in private he was busy to the end. Long after the disease that was to grind him slowly down to the grave had laid its grasp firmly upon him, it was quite inspiring to work beside him and

witness the vigour with which he applied himself to hard mental effort. In him the academic life of this city has lost a force that told for righteousness in precept and example; but to those of us who knew him as teacher, colleague, and friend, his memory will continue sweet and revered, whilst the Medical School of Glasgow, and its students past and present, will long continue to reap the benefits that are the outcome of his high character, steadiness of aim, and devoted labour.

T. K. MONRO.

RULES GOVERNING THE COMPETITION FOR THE GRAHAM MEDAL.

(Printed by Order of the Council.)

1. The competition for the Graham Medal shall be under the authority and control of the Council of the Philosophical Society of Glasgow, whose decision on all points connected therewith shall be final.

2. Each candidate shall forward to the Secretary of the Philosophical Society of Glasgow, 207 Bath Street, Glasgow, on or before 14th March of the year in which the competition is held, a paper giving an account of an unpublished original research conducted by himself in any branch of chemical science.

3. The medal shall be awarded to the candidate whose research, in the opinion of the Council, or of the person or persons whom they may appoint to adjudicate in the matter, is of the highest merit and most likely to aid in the advancement of chemical science.

4. The successful candidate shall read the paper, on account of which the medal is awarded, to the Philosophical Society of Glasgow. The paper shall thereafter be published in the *Proceedings* of the Society, and its publication elsewhere shall not take place without the permission of the Council.

5. No award shall be made if, in the opinion of the Council, no candidate has contributed a paper of sufficient merit.

MINUTES OF SESSION,

1898-99.

2nd November, 1898.

The First Ordinary Meeting, for Session 1898-99, of the Philosophical Society of Glasgow, was held within the Rooms, 207 Bath Street, on the Evening of Wednesday, 2nd November, 1898, at eight o'clock. Dr. Duncan, President, in the Chair.

1. The Minutes of Meeting, of date 20th April, 1898, having already been circulated amongst the Members, were held as read, were approved of, and were signed by the Chairman.

2. The President delivered an Address entitled "Some Points connected with the Social Progress of Scotland during the past Twenty-five Years."

On the motion of Mr. Handasyde Dick, a cordial vote of thanks was awarded to the President for his Address.

3. Dr. Wm. Jas. Fleming made a Communication entitled "A Simple and Inexpensive Method of Localising by the X-Rays."

A discussion followed, in which Mr. Falconer and Professor Barr took part. On the motion of the President, Dr. Fleming received a hearty vote of thanks for his Communication.

4. On the motion of Mr. J. F. Campbell, seconded by Mr. Falconer, Messrs. Richard Brown and John M'Kellar were appointed Auditors of the Treasurer's Books.

5. The President intimated that the following gentlemen had been duly elected Members of the Society :—

1. Mr. J. R. Gow, Insurance Secretary, 12 Renfield Street, Glasgow. Recommended by Mr. John Mann, Dr. Freeland Fergus, and Mr. Ludovic M'L. Mann.
2. Mr. David Wilson, M.A., D.Sc., F.C.S., Carbeth, Killearn. Recommended by Dr. Freeland Fergus, Mr. Angus M'Lean, and Dr. Magnus Maclean.

3. Mr. HUGH KELLY, M.D., Catrine Bank, Shields Road, Pollokshields, Glasgow. Recommended by Mr. Wm. Gray, Mr. Archd. Campbell, and Mr. Charles C. Swan.

4. Mr. ROBERT CAIRD, Shipbuilder, 56 Esplanade, Greenock. Recommended by Dr. Freeland Fergus, Mr. Angus M'Lean, and Mr. Oswald Fergus.

5. Mr. ISAAC LOW, Plumber, 71 Stirling Road, Glasgow. Recommended by Prof. John Glaister, Dr. Freeland Fergus, and Dr. Magnus Maclean.

6. Mr. JOHN H. TEACHER, M.B., 32 Huntly Gardens. Recommended by Dr. Freeland Fergus, Mr. Angus M'Lean, and Dr. Magnus Maclean.

7. Mr. JOHN SINCLAIR, 150 Buchanan Street. Recommended by Mr. John M'Kissack, Mr. A. Lindsay Miller, and Dr. Magnus Maclean.

8. Mr. WILLIAM FREW, Ph.D., Wellpark Brewery, Glasgow. Recommended by Dr. Freeland Fergus, Dr. Magnus Maclean, and Mr. John Mann.

9. Mr. ROBERT STEVENSON, M.D., Labrador, Innellan. Recommended by Dr. Freeland Fergus, Dr. Robert Fullerton, and Dr. Magnus Maclean.

10. Mr. JAMES HOPE, Works Manager, 8 Elenbank Terrace, Lenzie. Recommended by Mr. J. Craig Annan, Dr. Freeland Fergus, and Dr. Magnus Maclean.

11. Mr. JOHN C. KING, Newspaper Proprietor, 21 Newton Place, Glasgow. Recommended by Mr. Thomas Adam, Mr. John Lauder, and Mr. Walter W. Blackie.

12. Mr. R. WILSON THOM, 8 Woodside Terrace. Recommended by Mr. Wm. Ewing, Dr. Freeland Fergus, and Mr. Walter W. Blackie.

13. Mr. NELSON MITCHELL, 3 Great Western Terrace. Recommended by Mr. William Ewing, Dr. Freeland Fergus, and Mr. Walter W. Blackie.

6. The PRESIDENT also intimated that the Council recommended the nomination of the Right Hon. Lord Blythswood for the Presidency shortly to become vacant.

REPORT OF COUNCIL FOR SESSION 1897-98.

I. *Meetings.*—During the Session 1897-98 one Special and twelve Ordinary Meetings were held. The opening meeting of the Session took the form of a Conversazione, which was very numerously attended, and at which several gentlemen made important communications. Excluding these, there were seventeen papers contributed to the Society, as compared with fifteen in the previous Session.

II. *Science Lectures Association.*—The lecture delivered under the auspices of the Science Lectures Association was not given at a meeting of the Society, but took the form of a public lecture in St. Andrew's Halls. The Committee charged with the arrangements invited Professor Sir Robert Ball, F.R.S., to give one of his popular lectures on an astronomical subject. In accordance with this invitation, Sir Robert Ball lectured on "A Universe

in Motion." There was a large audience, both of members of the Society and of the general public.

III. *Sections.*—The *Architectural Section* held eight meetings during the Session. At one of these Professor Jones delivered a special lecture on "Hegel and Art." The *Economic Science Section* also held sectional meetings, and papers were contributed to the Society's *Proceedings* by it and by the Geographical, the Philological, and the Mathematical Sections. At the beginning of the Session the Economic Science Section took action for the establishment of two courses of popular evening lectures upon their special science. These proved very successful, and arrangements have been made for their continuance during this winter.

IV. *Proceedings, Volume XXIX.*—This volume of the *Proceedings* was distributed to the members by the middle of August. It contains fifteen communications.

V. *Membership.*—At the beginning of the Session there were 627 Ordinary Members on the Roll. During the Session 38 Members were elected, making a total of 665. Of these, 11 have resigned, 14 have died, 4 have been placed on the "Suspense List," and 9 have been struck off the Roll for non-payment of subscription, so that at the beginning of Session 1898-99 there were 627 Ordinary Members on the Society's List. Amongst those who have died we notice the names of Sir James Bain, F.R.S.E., and of Mr. Dugald Bell, F.G.S., both of whom for many years took an active interest in the meetings of the Society. Of the new Members admitted during the Session, 4 qualified themselves as Life Members. There are now 160 Members of that class out of 177 who have so enrolled themselves. The Roll now includes 16 Honorary Members, 8 Corresponding Members, and 627 Ordinary Members (Annual and Life), or a total of 651.

VI. *Library.*—As usual, the Annual Report of the Honorary Librarian is appended hereto, from which it will be noticed that steps have been taken to prepare and issue a new catalogue.

VII. *Finance.*—The Treasurer's Statement for 1897-98 opens with a balance of £71 13s. due to him, against which there was an Investment in Railway Stock of £47 9s., the remainder, at cost, of a larger Investment partly sold. The Accounts close with £54 11s. 11d. due to the Treasurer, with the same Investment standing against it. It is believed that, as usual at the close of the financial year, the Society has practically no outstanding liabilities.

Separate Statements are given by the Treasurer, as formerly, showing the position of the two funds which the Society holds in trust, viz.:—"The Graham Medal and Lecture Fund," and "The Glasgow Science Lecture Fund," the Balances of Revenue being £64 15s. 11d. and £34 18s. 6d. respectively.

By Order and in name of the Council,

(Signed) FREELAND FERGUS,
Honorary Secretary.

Report of the Library Committee.

Your Committee have to report that during the past year 56 volumes and 9 parts of works were added to the Library by purchase, and 37 volumes, 65 parts, and 15 pamphlets were presented.

The periodicals received at the Library number 99, of which 67 are bought and 32 presented.

The Society's *Proceedings* were forwarded to 183 societies and public departments; and 137 volumes and 131 parts were received in exchange.

Altogether during the year there have been added to the Library 336 volumes, 205 parts, and 15 pamphlets, making an estimated total of 13,129 volumes.

Since last report 208 volumes have been bound.

In addition to the large number of works consulted in the Library, 781 books and 668 journals were issued to members during the Session.

In Vol. XXIX. of the *Proceedings* there will be found a list of the additions to the Library by purchase up till June, 1898; the titles of the books presented, with the names of the donors; the names of the societies, &c., with which exchanges are effected; and a list of the periodicals received at the Library.

The Council have sanctioned the issue of a new catalogue, and it is now in preparation.

JOHN ROBERTSON, Hon. Librarian,
Convener.

16th November, 1898.

The Annual Business Meeting, for Session 1898-99, of the Philosophical Society of Glasgow, was held within the Rooms, 207 Bath Street, on the evening of Wednesday, 16th November, 1898, at Eight o'clock. The President, Dr. Ebenezer Duncan, occupied the Chair.

1. The Minutes of previous Meeting, of date 2nd November, 1898, having been printed in the Billet calling the Meeting, were held as read, were approved of, and were signed by the Chairman.

2. The following New Members were duly admitted:—

1. Mr. J. R. Gow.
2. Dr. David Wilson.
3. Dr. Hugh Kelly.
4. Mr. Robert Caird.
5. Mr. Isaac Low.
6. Dr. John H. Teacher.
7. Mr. John Sinclair.
8. Dr. Wm. Frew.
9. Dr. Robert Stevenson.
10. Mr. James Hope.
11. Mr. John C. King.
12. Mr. R. Wilson Thom.
13. Mr. Nelson Mitchell.

3. The Honorary Secretary, Dr. Freeland Fergus, presented the Annual Report of the Council, which was adopted.

4. The Honorary Treasurer, Mr. Mann, presented the Annual Financial Statement, signed by Messrs. Richard Brown and J. M'Kellar, Auditors, which, on the motion of the President, was adopted.

5. The Honorary Librarian, Mr. Robertson, in presenting the Library Committee's Annual Report, made reference to the New Catalogue in course of preparation. The Report was adopted, and a vote of thanks accorded to donors of books, &c.

6. Dr. Duncan, in demitting office as President, proposed as his successor the Right Honourable the Lord Blythswood. This was unanimously agreed to.

Dr. Duncan then left the Chair, which was thereafter occupied by Professor Barr, Vice-President.

On the motion of Professor Barr, a hearty vote of thanks was awarded to Dr. Duncan for the manner in which he had conducted the Society's affairs during the term of his Presidency.

7. Mr. F. T. Barrett, retiring Vice-President, proposed Mr. Paul Rottenburg as his successor. The motion was seconded by Dr. Turner, and unanimously agreed to.

8. On the motion of Dr. Duncan, seconded by Mr. Falconer, Mr. John Mann, C.A., Mr. John Robertson, and Dr. Freeland Fergus, were unanimously re-elected Honorary Treasurer, Honorary Librarian, and Honorary Secretary, respectively, and a vote of thanks for their past services was accorded to them.

9. On the motion of Mr. Lang, seconded by Mr. Annan, Mr. F. T. Barrett; Mr. James Paton, F.L.S.; Mr. Gilbert Thomson, C.E.; and Mr. J. R. Motion, were unanimously elected Members of Council, in room of Mr. William Lang, F.C.S.; Mr. W. B. Sayers, M.I.E.E.; Dr. Magnus Maclean, M.A., F.R.S.E.; and Mr. J. Craig Annan, who retire by rotation.

10. On the motion of Dr. Freeland Fergus, seconded by Mr. J. F. Campbell, Mr. Angus M'Lean, B.Sc., C.E., was appointed Acting Secretary.

Dr. ABSTRACT OF HONORARY TREASURER'S AND COMPARISON WITH

				1897-98.			*1896-97.*		
				£	s.	d.	*£*	*s.*	*d.*
To BALANCE from last year—									
Investment, Caledonian Railway £110, 3 per cent. Preferred Converted,				47	9	0	*325*	*3*	*7*
,, SUBSCRIPTIONS to 31st October, 1898—									
38 Entry-moneys of 1897-98 at 21s.,			£39 18 0						
Annual Dues at 21s.—									
Arrears,	£3 3 0								
For 1897-98, 437 Ordinary Members,	458 17 0								
,, ,, 34 New Members,	35 14 0								
			497 14 0						
Life Subscriptions at £10 10s.—									
5 Old Members,	£52 10 0								
4 New Members,	42 0 0								
			94 10 0						
				632	2	0	*670*	*19*	*0*
,, DIVIDENDS ON INVESTMENT—									
Caledonian Railway, April, 1898, less tax,			£1 11 11						
,, ,, Oct., ,, ,,			1 11 11						
				3	3	10	*10*	*8*	*10*
,, GENERAL RECEIPTS—									
Bank Interest,			£1 15 11						
Proceedings sold,			1 4 7						
				3	0	6	*6*	*10*	*4*
,, LEGACY by the late Sir Michael Connal—									
Fourth instalment, less duty,				1	2	6	*0*	*0*	*0*
,, ARCHITECTURAL SECTION—									
Associates' fees at 5s.,				19	5	0	*19*	*15*	*0*
,, ECONOMIC SCIENCE SECTION—									
Associates' fees at 5s.,				2	15	0	*3*	*10*	*0*
,, GEOGRAPHICAL AND ETHNOLOGICAL SECTION—									
Associates' fees, at 5s.,				3	5	0	*0*	*0*	*0*
,, BALANCE due to Treasurer,				54	11	11	*71*	*13*	*0*
				766	14	9	*1,107*	*19*	*9*

Memo. by Treasurer.—The Society's Investments are—

(1) Bath Street Joint Buildings, as in last Account,		£3,933	7 4½
Less Society's part of £1,700 remaining on Bond,		1,200	0 0
		£2,733	7 4½
(2) Caledonian Railway Stock, as in last Account,		47	9 0
	J. M.	£2,780	16 4½

ACCOUNT—SESSION 1897-98. **Cr.**
SESSION 1896-97.

				1897-98.			*1896-97.*		
				£	s.	d.	£	s.	d.
By BALANCE from last year—due to Treasurer,				71	13	0	*0*	*0*	*0*
,, GENERAL EXPENDITURE to 31st October, 1898—									
Ex-Secretary's retiring Allowance,	£50	0	0						
Salary to Secretary's Assistant,	36	13	4						
Allowance for Treasurer's Clerks,	15	0	0						
Commission to Collector,	6	14	6						
Conversazione of 3rd November, 1897,	41	10	2						
				149	18	0	*95*	*10*	*0*
New Books & Periodicals, British & Foreign,	£96	14	4						
Bookbinding,	25	5	9						
Printing Circulars, *Proceedings*, &c.,	187	16	3						
Lithographs, &c., for *Proceedings*, &c.,	3	17	11						
Postage and delivery of Circulars, Letters, &c.,	30	6	5						
Stationery, &c.,	10	13	9						
				354	14	5	*416*	*11*	*2*
Fire Insurance on Library for £5,400,	£6	3	6						
Postages, &c., per Secretaries, £3 1s. 11d.; per Treasurer, £2 2s. 7½d.; and Sundries, £1 12s. 4d.,	6	16	10½	13	0	4½	*14*	*7*	*10*
,, Joint Expenses of Rooms—Society's half of £261 0s. 1d., being Insurance, Taxes, Cleaning, Repairs, Lighting, and Heating; Salaries of Curator and Assistant, and its proportion of Interest on Bond, £34 16s.; less half of £105, Revenue from Letting,				112	16	0½	*204*	*11*	*7½*
,, LORD KELVIN'S JUBILEE MEETING—Expenses,				0	0	0	*10*	*7*	*5½*
,, LECTURE EXPENSES—Sundries,				0	0	0	*2*	*9*	*0*
,, SUBSCRIPTIONS TO SOCIETIES—									
Ray Society, 1897,	£1	1	0						
Palæontographical Society, 1897,	1	1	0						
				2	2	0	*2*	*2*	*0*
,, SANITARY AND SOCIAL ECONOMY SECTION—									
Expenses per Treasurer of Section,				0	0	0	*0*	*0*	*0*
,, ARCHITECTURAL SECTION—									
Expenses per Treasurer of Section,				11	11	8	*10*	*13*	*7*
,, ECONOMIC SCIENCE SECTION—									
Expenses per Treasurer and Secretary of Section,				1	1	3	*3*	*18*	*1*
,, GEOGRAPHICAL AND ETHNOLOGICAL SECTION—									
Expenses per Treasurer of Section, 18s.; Printing, 12s.,				1	10	0	*0*	*0*	*0*
,, PHILOLOGICAL SECTION—									
Printing,				0	19	0	*0*	*0*	*0*
,, REDUCTION of Society's half of Bond over Buildings,				0	0	0	*300*	*0*	*0*
,, BALANCE OF—									
Investment—Caledonian Railway £110 3 per cent. Preferred Converted,				47	9	0	*47*	*9*	*0*
				766	14	9	*1,107*	*19*	*9*

GLASGOW, *8th November, 1898.*—We, the Auditors appointed by the Society to examine the Treasurer's Accounts for the year 1897-98, have examined the same, of which the above is an Abstract, and have found them correct, the Balance due to Treasurer being Fifty-four Pounds Eleven Shillings and Elevenpence Sterling.

(Signed) RICHARD BROWN.
JOHN M'KELLAR.

JNO. MANN, C.A., *Honorary Treasurer.*

GRAHAM MEDAL AND LECTURE FUND.

Dr. ABSTRACT OF TREASURER'S ACCOUNT—SESSION 1897-98. Cr.

CAPITAL AT 1ST NOVEMBER, 1897—							
Glasgow and South-Western Railway Co. 4% Preference Stock in name of the Philosophical Society, in Trust,	£250	0	0				
Value of Die at H.M. Mint,	18	18	0				
				£268	18	0	
Cash in Bank,				54	5	1	
REVENUE—							
Dividend, April, 1898, less Tax,	£4	16	8				
,, Oct., ,, ,,	4	16	8				
Interest from Bank,	0	17	6				
				10	10	10	
				£333	13	11	

CAPITAL AT 31ST OCTOBER, 1898—							
Investment, *per contra*,	£250	0	0				
Die,	18	18	0				
				£268	18	0	
BALANCE, BEING REVENUE—							
In Bank, on Deposit Receipt,				64	15	11	
				£333	13	11	

GLASGOW, 8th November, 1898.—Examined and found correct.

(Signed) RICHARD BROWN.
JOHN M'KELLAR.

JNO. MANN, C.A., *Honorary Treasurer.*

THE SCIENCE LECTURES ASSOCIATION FUND.

Dr. ABSTRACT OF TREASURER'S ACCOUNT—SESSION 1897-98. Cr.

CAPITAL AT 1ST NOVEMBER, 1897—						
£200 Caledonian Railway Company 4% Preference Stock, No. 1, in name of the Philosophical Society, in Trust, cost,	£244	4	8			
On Deposit Receipt,	8	5	4			
				£252	10	0
Cash in Bank (Revenue),				35	14	3
REVENUE—						
Dividend, April, 1898, less Tax,	£3	17	4			
,, Oct., ,, ,,	3	17	4			
Interest from Bank,	0	13	2			
				8	7	10
TICKETS sold for Lecture,				83	3	0
				£379	15	1

CAPITAL AT 31ST OCTOBER, 1898—						
Investment, *per contra*,	£244	4	8			
In Bank, on Deposit Receipt,	8	5	4			
				£252	10	0
EXPENDITURE—						
Honorarium and Expenses for Lecture on 16th February, 1898, on "A Universe in Motion," by Professor Sir Robert Ball, F.R.S.,				92	6	7
BALANCE, BEING REVENUE—						
In Bank, on Deposit Receipt,				34	18	6
				£379	15	1

GLASGOW, 8th November, 1898.—Examined and found correct.

(Signed) RICHARD BROWN.
JOHN M'KELLAR.

JNO. MANN, C.A., *Honorary Treasurer.*

11. On the motion of Mr. Ewing, it was agreed that Messrs. Alex. Scott, Robert Blyth, and George Miller, be re-elected Members of Council of the Geographical and Ethnological Section, each for three years, and that Dr. Robert Fullerton be re-elected Honorary Secretary and Treasurer of the Section.

12. It was moved by Dr. Fergus, on behalf of Professor Glaister, and agreed to, that the following be elected Office-Bearers of the Sanitary and Social Economy Section:—

President—Mr. Gilbert Thomson, M.A., C.E.

Vice-Presidents—Sir Charles Cameron, Bart., M.D., LL.D.
A. K. Chalmers, M.D., D.P.H.(Camb.).

Members of Council.

Mr. T. L. Watson.
Mr. W. Rattray.
Professor Jamieson, C.E.
Mr. Wm. Key.
Mr. D. M. Alexander.
Mr. D. W. Buchan.
Dr. James K. Kelly.
Mr. John Ross.
Professor Glaister.
Dr. R. Stevenson.
Dr. Ebenezer Duncan.

Professor Glaister—*Provisional Secretary.*

13. On the motion of Mr. R. F. Muirhead, the following were elected Office-Bearers of the Mathematical and Physical Section:—

President—Magnus Maclean, D.Sc., M.A., F.R.S.E.

Vice-Presidents—J. T. Bottomley, M.A., D.Sc., F.R.S.
Henry Dyer, D.Sc., M.A., C.E.

Secretary and Treasurer—Mr. R. F. Muirhead, M.A., B.Sc., 24 Kersland Street.

Members of Council.

Mr. A. J. G. Barclay, M.A.
Prof. Jas. Blyth, M.A., F.R.S.E.
Professor W. Jack, LL.D.
Professor A. Jamieson, C.E.
Mr. A. V. Lothian, M.A., B.Sc.
Mr. H. A. Mavor, M.I.E.E.

14. Mr. Handasyde Dick stated that no arrangements had yet been made as to nomination of Office-Bearers for the Economic Science Section.

15. Dr. Colville proposed the following as Office-Bearers of the Philological Section:—

President—MR. JAMES COLVILLE, M.A., D.Sc.

Secretary and Treasurer—MR. JOHN CLARK, M.A.

Members of Council.

DR. ROSS.	MR. JUSTUS WIDMER.
DR. ANNANDALE.	MR. DAVID LAMB.
MR. GEORGE NEILSON.	MR. J. F. CAMPBELL.

MR. HECTOR REY, B.A.

The motion was agreed to.

16. Dr. Colville read a paper entitled "The Scottish Vernacular as a Philological Study," being a contribution from the Philological Section.

A discussion took place, in which the Chairman and Messrs. Campbell, Gilbert Thomson, Falconer, Barrett, and Knight took part.

On the motion of the Chairman, a hearty vote of thanks was awarded to Dr. Colville for his Paper.

17. The Chairman intimated that the following gentlemen had been elected members of the Society:—

1. Mr. WILLIAM KEMP; Alexander, Fergusson & Co., Limited, Ruchill, Maryhill. Recommended by Mr. John F. Campbell, Mr. J. M'Kellar, and Mr. William H. Houston.
2. Mr. JAMES DALY, 2 Princes Gardens. Recommended by Mr. John White, Mr. W. Arthur Coulson, and Dr. Fergus.
3. Mr. NINIAN MACWHANNELL, Architect, 58 West Regent Street. Recommended by Mr. P. Macgregor Chalmers, Mr. A. Lindsay Miller, and Dr. Freeland Fergus.
4. Mr. T. REID PEACOCK, Architect, 122 Wellington Street. Recommended by Mr. Robert Turnbull, Mr. A. Lindsay Miller, and Mr. John Mann.
5. Mr. P. M. HANNAY, Shipbroker, Bridge of Allan. Recommended by Mr. A. C. Whyte, Dr. Freeland Fergus, and Mr. Angus M'Lean.
6. Mr. W. N. WHYTE, Architect, 103 West Regent Street. Recommended by Mr. A. Lindsay Miller, Mr. Robert Turnbull, and Dr. Fergus.
7. Mr. R. W. COOKE-TAYLOR, H.M. Superintending Inspector of Factories, 121 West Regent Street. Recommended by Mr. George Handasyde Dick, Mr. Robert Lamond, and Dr. Freeland Fergus.
8. Mr. A. H. MAY, 1 Crown Circus, Dowanhill. Recommended by Mr. R. Cooper Rundell, Mr. R. Hunter Dunn, and Dr. Freeland Fergus.
9. Mr. JAMES SCOTT WILSON, Metal Merchant, 154 West George Street. Recommended by Mr. John Wilson, Mr. W. S. Brown, and Mr. John Mann.

30th November, 1898.

The Third Ordinary Meeting of the Philosophical Society of Glasgow, for Session 1898-99, was held in the Rooms of the Society, 207 Bath Street, on the Evening of Wednesday, 30th November, 1898, at eight o'clock. In the absence of the President and Vice-Presidents, Mr. George Handasyde Dick occupied the Chair.

1. The Minutes of previous Meeting, of date 16th November, 1898, having been printed in the Billet calling the Meeting, were held as read, were approved of, and were signed by the Chairman.

2. The following new Members were duly admitted:—

1. Mr. William Kemp.
2. Mr. James Daly.
3. Mr. Ninian Macwhannell.
4. Mr. T. Reid Peacock.
5. Mr. P. M. Hannay.
6. Mr. W. M. Whyte.
7. Mr. R. W. Cooke-Taylor.
8. Mr. A. H. May.
9. Mr. James Scott Wilson.

3. The Rev. Frederick Smith, Cromlix, Perthshire, read a Paper entitled "Palæolithic Man in Scotland," the paper being illustrated by lantern slides and by specimens. On the invitation of the Chairman, Professor Young addressed the meeting, and thereafter a hearty vote of thanks was awarded to the Rev. Mr. Smith for his paper.

4. The Chairman intimated that the following gentlemen were duly elected Members of the Society:—

1. Mr. Horatio S. Carslaw, M.A., Assistant to the Professor of Mathematics, University of Glasgow. Recommended by Dr. Magnus Maclean, Professor Jack, and Professor Lodge.

2. Mr. J. D. Cormack, B.Sc., Lecturer in Electrical Engineering, University of Glasgow. Recommended by Professor Barr, Dr. Magnus Maclean, and Mr. Angus M'Lean.

3. Mr. John Downie, Sheriff-Clerk of Lanarkshire, Burnawn, Uddingston. Recommended by Professor Smart, Mr. John A. Todd, and Mr. George Handasyde Dick.

4. Mr. William A. R. Jex Long, Paint Manufacturer, Larch Hill, Moffat. Recommended by Mr. Thomas M. Motion, Mr. James R. Motion, and Dr. James Colville.

5. Mr. Alexander James Gordon, Paint and Colour Manufacturer, 200-202 George Street. Recommended by Mr. Thomas M. Motion, Mr. James R. Motion, and Dr. James Colville.

6. Mr. W. A. CHAMEN, Electrical Engineer, Drumard, Partickhill Road, Glasgow. Recommended by Bailie Wm. Maclay, Mr. Jas. D. Borthwick, and Dr. Freeland Fergus.

7. Mr. ROBERT O. HAMILTON, Merchant, Victoria Grain Mills, West Street, Kingston, Glasgow. Recommended by Mr. T. N. Whitelaw, Dr. Freeland Fergus, and Mr. Angus M'Lean.

14th December, 1898.

The Fourth Ordinary Meeting of the Philosophical Society of Glasgow, for Session 1898-99, was held in the Rooms of the Society, 207 Bath Street, on the Evening of Wednesday, 14th December, 1898, at Eight o'clock. Professor Smart, Vice-President, occupied the Chair.

1. The Minutes of previous Meeting, of date 30th November, 1898, having been printed in the Billet calling the Meeting, were held as read, were approved of, and were signed by the Chairman.

2. The following New Members were duly admitted:—

1. Mr. H. S. Carslaw, M.A.
2. Mr. J. D. Cormack, B.Sc.
3. Mr. John Downie.
4. Mr. Wm. A. R. Jex Long.
5. Mr. Alex. James Gordon.
6. Mr. W. A. Chamen.
7. Mr. Robert O. Hamilton.

3. Mr. John Mann, Jun., M.A., C.A., read a Paper entitled "Better Houses for the Poor—will they Pay?" being a communication from the Economic Science Section. A discussion followed, in which the Chairman, Mr. Carlile, Mr. Motion, ex-Bailie Chisholm, and Dr. J. O. Mitchell took part. On the motion of the Chairman, a hearty vote of thanks was accorded to Mr. Mann for his Paper.

4. The Honorary Secretary intimated that Dr. J. B. Russell, Local Government Board, Edinburgh, who was recommended by the Council, had been unanimously elected an Honorary Member of the Society; and that the following gentlemen had been duly elected Ordinary Members:—

1. ROBERT M'LAREN, Bank Agent, Royal Bank, Garscube Cross, Glasgow. Recommended by Mr. John F. Campbell, Dr. Freeland Fergus, and Mr. John Mann.

2. ROBERT RAMSEY, Jun., 14 Park Terrace. Recommended by Mr. Robert Ramsey, Dr. Freeland Fergus, and Mr. John Mann.

3. DAVID M'COWAN, Jun., Insurance Broker, 6 Eton Gardens, Glasgow. Recommended by Dr. Freeland Fergus, Mr. Oswald Fergus, and Mr. Angus M'Lean.

4. CHARLES WORKMAN, M.D., F.F.P.&S.G., 5 Woodside Terrace, Glasgow. Recommended by Dr. T. K. Monro, Mr. Alexander B. Kirkpatrick, and Dr. Freeland Fergus.

5. On the motion of Mr. George Handasyde Dick the following were appointed Office-Bearers of the Economic Science Section for 1898-99 :—

President—*MR. GEORGE HANDASYDE DICK.

Vice-Presidents— MR. GEORGE YOUNGER. MR. W. W. BLACKIE, B.Sc.

Honorary Secretary—MR. ROBERT LAMOND, LL.B.

Honorary Treasurer—*MR. JOHN MANN, Jun., M.A., C.A.

Council.

*MR. T. N. WHITELAW.	MR. JOHN A. TODD, B.L.
PROFESSOR WM. SMART, LL.D.	COUNCILLOR D. M. STEVENSON.
MR. ALEXANDER MACINDOE, C.A.	MR. JAMES F. MARTIN.
MR. A. A. MITCHELL, LL.B.	MR. D. MACKENZIE.

* Retire by rotation in 1899.

4th January, 1899.

The Fifth Ordinary Meeting of the Philosophical Society of Glasgow, for Session 1898-99, was held in the Rooms of the Society, 207 Bath Street, on the Evening of Wednesday, 4th January, 1899, at eight o'clock. In the absence of the President and of the three Vice-Presidents, Mr. George Handasyde Dick occupied the Chair.

1. The Minutes of previous Meeting, of date 14th December, 1898, having been printed in the Billet calling the Meeting, were held as read, were approved, and were signed by the Chairman.

2. The following gentlemen were admitted to the Ordinary Membership of the Society :—

1. Mr. Robert M'Laren.
2. Mr. Robert Ramsey, Jun.
3. Mr. David M'Cowan, Jun.
4. Dr. Charles Workman.

3. The Chairman intimated that, on account of his splendid contributions to the Science of State Medicine, and of his

invaluable services to the City of Glasgow, the Council had agreed to nominate J. B. Russell, M.D., LL.D., for the Honorary Membership of the Society. He further explained that, at the last Meeting, Dr. Russell had been unanimously elected to this rank. After some remarks by Sir Wm. Gairdner, K.C.B., M.D., and by Bailie Dick, Convener of the Health Committee of the Corporation of Glasgow, Dr. Russell was duly admitted an Honorary Member. Having signed the Roll as such, he expressed his warm thanks to the Society for the honour which it had conferred upon him.

4. Dr. R. S. Thomson, Physician to the Glasgow Smallpox Hospital, read a paper entitled "A Smallpox Hospital Experience of the Protective Influence of Vaccination." On the motion of Dr. Fergus, the cordial thanks of the Society were conveyed to Dr. Thomson for his communication.

5. The Honorary Secretary intimated that the following gentlemen had been duly elected to the Membership of the Society:—

1. J. O. Mitchell, LL.D., 7 Huntly Gardens. Recommended by Dr. Freeland Fergus, Mr. W. W. Carlile, and Mr. Angus M'Lean.
2. Hamilton Clelland Marr, M.D., Woodilee Asylum, Lenzie. Recommended by Mr. J. R. Motion, Dr. Freeland Fergus, and Mr. William James Wood.
3. J. B. Montgomerie-Fleming, of Kelvinside. Recommended by Mr. Mann, Dr. Fergus, and Mr. Oswald Fergus.

18th January, 1899.

The Sixth Ordinary Meeting, for Session 1898-99, of the Philosophical Society of Glasgow, was held within the Rooms of the Society, 207 Bath Street, Glasgow, on the Evening of Wednesday, 18th January, 1899, at eight o'clock. Professor Smart, LL.D., Vice-President, occupied the Chair.

1. The Minutes of previous Meeting, of date 4th January, 1899, having been printed in the Billet calling the Meeting, were held as read, were approved, and were signed by the Chairman.

2. The following New Members were duly admitted:—

1. Dr. J. O. Mitchell. 2. Dr. Hamilton Clelland Marr.
3. Mr. J. B. Montgomerie-Fleming.

3. Professor A. Humboldt Sexton, F.C.S., F.I.C., read a Paper entitled "The Evolution of the Blast Furnace." On the motion of the Chairman, a cordial vote of thanks was awarded to Professor Sexton for his Paper.

1st February, 1899.

The Seventh Ordinary Meeting, for Session 1898-99, of the Philosophical Society of Glasgow, was held within the Rooms of the Society, 207 Bath Street, Glasgow, on the Evening of Wednesday, 1st February, 1899, at eight o'clock. Professor Barr, D.Sc., Vice-President, occupied the Chair.

1. The Minutes of previous Meeting, of date 18th January, 1899, having been printed in the Billet calling the Meeting, were held as read, were approved, and were signed by the Chairman.

2. Dr. Fergus moved the suspension of the Standing Orders in order to submit a motion. This was unanimously agreed to. He then moved—"That the Society instruct the Council to cause a Memorial Notice of the late Professor Coats, a former Vice-President, to be prepared and to be read before the Society at an early date." He also moved—"That an expression of sympathy be sent to Mrs. Coats." The motion, which was supported by the Chairman, was passed unanimously.

3. (i.) Dr. MacLachlan, Dumbarton, read a Paper on "Infection carried by Flies." After some remarks by Mr. Falconer, Dr. MacLachlan, on the motion of the Chairman, was awarded the thanks of the Society.

(ii.) Mr. R. Hedger Wallace, Edinburgh, read a Paper on "The Adulteration of Agricultural Food Produce." After some discussion by Messrs. Falconer and White and the Chairman, a hearty vote of thanks was awarded to Mr. Wallace.

15th February, 1899.

The Eighth Ordinary Meeting, for Session 1898-99, of the Philosophical Society of Glasgow, was held within the Rooms of the Society, 207 Bath Street, on the Evening of Wednesday, 15th

February, 1899, at eight o'clock. Professor Smart, LL.D., Vice-President, occupied the Chair, which he afterwards vacated in favour of Mr. George Handasyde Dick, President of the Economic Science Section.

1. The Minutes of previous Meeting, of date 1st February, 1899, having been printed in the Billet calling the Meeting, were held as read, were approved, and were signed by the Chairman.

2. Mr. A. B. M'Lean was duly admitted an Ordinary Member of the Society.

3. Sheriff Wm. C. Smith read a Paper entitled "Imperial Grants considered as Adjustments of Taxation," being a communication from the Economic Science Section. A discussion followed, in which the Chairman (Mr. Handasyde Dick), Messrs. Martin and Lamont, and Professor Smart took part. On the motion of the Chairman, a cordial vote of thanks was awarded to Sheriff Smith for his Paper.

1st March, 1899.

The Ninth Ordinary Meeting of the Philosophical Society of Glasgow, for Session 1898-99, was held within the Rooms of the Society, 207 Bath Street, Glasgow, on the Evening of Wednesday, 1st March, 1899, at eight o'clock—Lord Blythswood, President, in the Chair.

1. The Minutes of previous Meeting, of date 15th February, 1899, were read, were approved, and were signed by the Chairman.

2. Lord Blythswood returned thanks to the Society for electing him to the office of President, and thereafter introduced Mr. A. A. Campbell Swinton, who delivered the Science Lecture under the auspices of the Science Lecture Trust. The Lecture was on "Electric Discharges in Vacuo, and the Röntgen Rays," and was illustrated by a series of lantern slides and by numerous interesting experiments. A discussion followed, in which Lord Blythswood and Lord Kelvin took part.

3. On the motion of Lord Blythswood, seconded by Lord Kelvin, a cordial vote of thanks was awarded to Mr. Campbell Swinton.

8th March, 1899.

A Special Meeting of the Philosophical Society of Glasgow was held on the Evening of Wednesday, 8th March, 1899, in the Rooms of the Society, 207 Bath Street, at eight o'clock—Professor Barr, D.Sc., Vice-President, in the Chair.

1. Dr. Magnus Maclean read a Paper on "The Different Instabilities of Convex Bodies Spinning in Different Directions on a Plane, first discovered in Celts." A discussion followed in which Professor Blyth and Messrs. Falconer, H. Mavor, and Carslaw took part. On the motion of the Chairman, Dr. Maclean was awarded the thanks of the Society.

2. Dr. Magnus Maclean, conjointly with Mr. Vincent J. Blyth, read a Paper on "Electric Methods of Space Telegraphy, and Results of some Experiments on Coherers." In the discussion which followed Professor Blyth and others took part. The Society, on the motion of the Chairman, awarded Dr. Maclean a cordial vote of thanks.

3. Mr. William R. Lang, B.Sc., University of Glasgow, read a Paper on "Alfred Nobel, and the Development of the Modern High Explosive." A discussion followed, and thereafter, on the motion of the Chairman, a hearty vote of thanks was awarded to Mr. Lang.

15th March, 1899.

The Tenth Ordinary Meeting, for Session 1898-99, of the Philosophical Society of Glasgow, was held within the Rooms of the Society, 207 Bath Street, on the Evening of Wednesday, 15th March. 1899, at eight o'clock—Mr. Paul Rottenburg, Vice-President, in the Chair.

1. The Minutes of the Ordinary Meeting, held on 1st March, 1899, and of the Special Meeting, held on 8th March, 1899, having been printed in the Billet calling the Meeting, were held as read, were approved, and were signed by the Chairman.

2. Dr. William Wallace read a Paper entitled "Reasons for rejecting Physico-Chemical Theories of the Origin of Life." A short discussion followed, in which the Chairman, Dr. Park, and

Mr. Handasyde Dick joined, and, on the motion of the Chairman, a vote of thanks was awarded to Dr. Wallace for his Paper.

3. Professor Richard Brown, St. Mungo's College, read a Paper entitled "Insanity in its relation to Punishment for Crime." A discussion followed, in which Professor Glaister, Mr. Scott, and the Chairman took part. On the motion of the Chairman, Professor Brown was awarded the thanks of the Society.

22nd March, 1899.

A Special Meeting of the Philosophical Society of Glasgow was held within the Rooms of the Society, 207 Bath Street, on the Evening of Wednesday, 22nd March, 1899, at eight o'clock—Mr. George Handasyde Dick, President of the Economic Science Section, in the Chair.

1. Mr. John A. Todd, B.L., Writer, Glasgow, Lecturer on Political Economy, read a Paper entitled "The Taxation of Land Values," being a criticism of the proposed Bill of the Corporation of Glasgow. An animated discussion followed, in which Mr. John Ferguson, Mr. Cree, Bailie Burt, Dr. Mitchell, Mr. Cherrie, Mr. Martin, Mr. M'Lardy, Mr. Mitchell, and Mr. Cassells took part. Mr. Todd replied, and, on the motion of the Chairman, he was awarded a hearty vote of thanks for his Paper.

2. The Chairman intimated that the following gentleman had been duly elected an Ordinary Member of the Society:—

JOHN TROTTER, 28 Gordon Street. Recommended by Mr. Charles R. Gibson, Mr. H. S. Carslaw, and Mr. A. M'Lean.

29th March, 1899.

The Eleventh Ordinary Meeting, for Session 1898-99, of the Philosophical Society of Glasgow, was held within the Rooms of the Society, 207 Bath Street, on the Evening of Wednesday, 29th March, 1899, at eight o'clock. In the absence of the President and Vice-Presidents, Mr. George Handasyde Dick, President of the Economic Science Section, occupied the Chair.

1. The Minutes of the previous Ordinary Meeting, of date 15th March, 1899, and those of the Special Meeting, of date 22nd

March, 1899, having been printed in the Billet calling the Meeting, were held as read, were approved, and were signed by the Chairman.

2. Mr. John Trotter was admitted an Ordinary Member of the Society.

3. The Chairman intimated that, by the courtesy of the Geological Society of Glasgow, Members of the Philosophical Society were invited to attend a Lecture by Dr. Traquair, F.R.S., on "Extinct Birds," to be delivered on 30th March, 1899. The Chairman also stated that the Geological Society had invited Members of the Philosophical Society to an Excursion to the Pass of Leny and the Bracklinn Falls on 3rd April, and he intimated that arrangements had been made for the Philosophical Society, together with the Geological Society, to visit the Dumbuck Crannog on 8th April.

4. Professor G. F. Scott Elliot, M.A., B.Sc., F.L.S., F.R.G.S., read a Paper entitled "The Prospect in Chinese Trade, and the Present Opportunity." The Paper was illustrated by lantern slides. A discussion followed, in which Mr. Falconer and the Chairman took part, and, on the motion of the Chairman, seconded by Dr. Dyer, a cordial vote of thanks was awarded to Professor Scott Elliot for his Paper.

12th April, 1899.

The Twelfth Ordinary Meeting, for Session 1898-99, of the Philosophical Society of Glasgow, was held within the Rooms of the Society, 207 Bath Street, on the Evening of Wednesday, 12th April, 1899, at eight o'clock—Professor Smart, LL.D., Vice-President, occupied the Chair.

1. The Minutes of previous Meeting, of date 29th March, 1899, having been printed in the Billet calling the Meeting, were held as read, were approved, and were signed by the Chairman.

2. Mr. Sam. Mavor, F.R.G.S., read a Paper entitled "From the Baltic to the Caspian—a Voyage across Russia." The Paper was illustrated by a series of Lantern Slides.

On the motion of the Chairman, a cordial vote of thanks was awarded to Mr. Mavor for his Paper.

26th April, 1899.

The Thirteenth Ordinary Meeting of the Philosophical Society of Glasgow was held within the Rooms of the Society, 207 Bath Street, on the Evening of Wednesday, 26th April, 1899, at Eight o'clock—Dr. Colville, President of the Philological Section, occupied the Chair.

1. The Minutes of previous Meeting, of date 12th April, 1899, having been printed in the Billet calling the Meeting, were held as read, were approved, and were signed by the Chairman.

2. A Report of the Society's visit, on 8th April, 1899, to the Dumbuck Crannog was read by Mr J. F. Campbell, who illustrated his statement by reference to Mr. W. A. Donnelly's drawings and diagrams, which had been kindly lent for the occasion. After some remarks by Mr. Donnelly, who was invited to be present, the Chairman moved that a hearty vote of thanks be given to Mr. Campbell for his Report and to Mr. Donnelly for the loan of his drawings and for his courtesy on the occasion of the Society's visit. This was agreed to.

3. Mr. James Knight, M.A., B.Sc., read a Paper entitled "Commercial Education on the Continent." After some discussion, in which Mr. Miller and the Chairman took part, the thanks of the Society were awarded to Mr. Knight for his Paper.

OFFICE-BEARERS

OF THE

PHILOSOPHICAL SOCIETY OF GLASGOW.

SESSION 1898-99.

President.

THE RIGHT HONOURABLE THE LORD BLYTHSWOOD.

Vice-Presidents.

*PROFESSOR WILLIAM SMART, LL.D.
PROFESSOR ARCHIBALD BARR, D.Sc.
MR. PAUL ROTTENBURG.

Honorary Vice-Presidents.

PROFESSOR THE RIGHT HON. LORD KELVIN, G.C.V.O., LL.D., D.C.L., F.R.S., Foreign Associate of the Institute of France, President R.S.E., and Member of the Prussian Order *Pour le Mérite.*

JAMES B. RUSSELL, B.A., LL.D., M.D.

PROFESSOR JOHN GRAY M'KENDRICK, M.D., LL.D., F.R.S., F.R.S.E., F.R.C.P.E.

PROFESSOR JOHN FERGUSON, M.A., LL.D., F.R.S.E., F.C.S., F.S.A., F.S.A.Scot.

EBENEZER DUNCAN, M.D., F.F.P.S.G.

MR. JOHN ROBERTSON, *Hon. Librarian.*
MR. JOHN MANN, C.A., *Hon. Treasurer.*
FREELAND FERGUS, M.D., *Hon. Secretary.*

Presidents of Sections.

MR. P. MACGREGOR CHALMERS, I.A., F.S.A.Scot., *Architectural Section.*

MR. GILBERT THOMSON, C.E., M.A., *Sanitary and Social Economy Section.*

GEORGE A. TURNER, M.D., *Geographical and Ethnological Section.*

MAGNUS MACLEAN, D.Sc., M.A., F.R.S.E., *Mathematical and Physical Section.*

MR. GEORGE HANDASYDE DICK, *Economic Science Section.*

JAMES COLVILLE, D.Sc., M.A., *Philological Section.*

Other Members of Council.

*MR. J. F. CAMPBELL.	MR. R. F. MUIRHEAD, M.A., B.Sc.
*MR. WALTER W. BLACKIE, B.Sc.	MR. A. V. LOTHIAN, M.A., B.Sc.
*MR. P. FALCONER.	MR. F. T. BARRETT.
*MR. JAS. D. BORTHWICK.	MR. JAMES PATON, F.L.S.
PROF. F. O. BOWER, F.R.S.	MR. J. R. MOTION.
PROF. G. G. HENDERSON, D.Sc.	PROFESSOR GLAISTER, M.D.

Acting Secretary.

ANGUS M'LEAN, B.Sc., C.E.

* *Retire by rotation in November, 1899.*

OFFICE-BEARERS OF SECTIONS, 1898-99.

ARCHITECTURAL SECTION.

President.

MR. P. MACGREGOR CHALMERS, I.A., F.S.A.Scot., Architect.

Vice-Presidents.

MR. A. LINDSAY MILLER, Architect.
MR. H. D. HORNE, Decorator.

Hon. Treasurer.

MR. WILLIAM HOWATT, I.M., F.S.I., Measurer, 146 Buchanan Street.

Hon. Secretary.

MR. NINIAN MACWHANNELL, Architect, 58 West Regent Street.

Honorary Members of Council.

JOHN HONEYMAN, R.S.A., F.R.I.B.A., I.A., Architect.
DAVID THOMSON, I.A., Architect.
JAMES THOMSON, F.R.I.B.A., I.A., Architect.
CAMPBELL DOUGLAS, F.R.I.B.A., I.A., Architect.
ALEX. MUIR, Builder.

Members of Council.

T. L. WATSON, F.R.I.B.A., I.A., Architect.
H. D. WALTON, Architect.
ANDREW BALFOUR, I.A., Architect.
ROBERT TURNBULL, I.A., Architect.
COLIN MENZIES, I.A., Architect.
JOHN ROGERSON, A.R.I.B.A., I.A., Architect.
J. SMELLIE, I.M., Measurer.
CHARLES CARLTON, Decorator.
A. BLACK, Smith.
JOHN L. DUNCAN, Decorator.
R. A. M'GILVRAY, Plasterer.
STEPHEN ADAM, F.S.A.Scot., Glass Stainer.

CHEMICAL SECTION.

(In abeyance.)

BIOLOGICAL SECTION.

(In abeyance.)

SANITARY AND SOCIAL ECONOMY SECTION.

MR. GILBERT THOMSON, C.E., M.A., *President.*

SIR CHARLES CAMERON, Bart., M.D., LL.D.,
A. K. CHALMERS, M.D., D.P.H.(Camb.), } *Vice-Presidents.*

Members of Council.

MR. T. L. WATSON.
MR. W. RATTRAY.
PROFESSOR JAMIESON, C.E.
MR. WM. KEY.
MR. D. M. ALEXANDER.
MR. D. W. BUCHAN.
DR. JAMES K. KELLY.
MR. JOHN ROSS.
PROFESSOR GLAISTER.
R. STEVENSON, M.D.

EBENEZER DUNCAN, M.D.

PROFESSOR GLAISTER, *Provisional Secretary.*

GEOGRAPHICAL AND ETHNOLOGICAL SECTION.

GEORGE A. TURNER, M.D., C.M., *President.*

MR. WILLIAM EWING, *Vice-President.*

ROBERT FULLERTON, M.D., *Honorary Secretary and Treasurer.*

Members of Council.

MR. ROBERT GOW.	MR. ALEXANDER SCOTT.
DR. FREELAND FERGUS.	MR. ROBERT BLYTH, C.A.
DR. JAMES COLVILLE.	MR. GEORGE MILLER.

MATHEMATICAL AND PHYSICAL SECTION.

MAGNUS MACLEAN, D.Sc., M.A., F.R.S.E., *President.*

J. T. BOTTOMLEY, M.A., D.Sc., F.R.S., HENRY DYER, D.Sc., M.A., C.E., } *Vice-Presidents.*

MR. R. F. MUIRHEAD, M.A., B.Sc., *Secretary and Treasurer.*

Members of Council.

MR. A. J. G. BARCLAY, M.A.	PROF. A. JAMIESON, C.E.
PROF. JAMES BLYTH, M.A., F.R.S.E.	MR. A. V. LOTHIAN, M.A., B.Sc.
PROF. W. JACK, LL.D.	MR. H. A. MAVOR, M.I.E.E.

PHILOLOGICAL SECTION.

JAS. COLVILLE, M.A., D.Sc., *President.*

MR. JOHN CLARK, M.A., *Secretary and Treasurer.*

Members of Council.

DR. ROSS.	MR. JUSTUS WIDMER.
DR. ANNANDALE.	MR. DAVID LAMB.
MR. GEO. NEILSON.	MR. J. F. CAMPBELL.

MR. HECTOR REY, B.A.

ECONOMIC SCIENCE SECTION.

*MR. GEORGE HANDASYDE DICK, *President.*

MR. GEORGE YOUNGER, MR. W. W. BLACKIE, B.Sc., } *Vice-Presidents.*

MR. ROBERT LAMOND, LL.B., *Hon. Secretary.*

*MR. JOHN MANN, jun., M.A., C.A., *Hon. Treasurer.*

Members of Council.

*MR. T. N. WHITELAW.	MR. JOHN A. TODD, B.L.
PROFESSOR WM. SMART, LL.D.	COUNCILLOR D. M. STEVENSON.
MR. ALEX. MACINDOE, C.A.	MR. JAMES F. MARTIN.
MR. A. A. MITCHELL, LL.B.	MR. D. MACKENZIE.

* *Retire by rotation in 1899.*

COMMITTEES APPOINTED BY THE COUNCIL.

COMMITTEE ON FINANCE.

LORD BLYTHSWOOD.	MR. J. D. BORTHWICK.
PROFESSOR BARR.	MR. J. F. CAMPBELL.
DR. FERGUS.	MR. JOHN MANN.

MR. MANN, *Convener.*

COMMITTEE ON THE LIBRARY.

LORD BLYTHSWOOD.	MR. W. W. BLACKIE.
PROFESSOR SMART.	DR. MACLEAN.
PROFESSOR BARR.	MR. R. F. MUIRHEAD.
MR. ROTTENBURG.	DR. G. A. TURNER.
PROFESSOR FERGUSON.	DR. J. COLVILLE.
MR. BARRETT.	MR. MACGREGOR CHALMERS.
DR. FERGUS.	MR. GILBERT THOMSON.
MR. LOTHIAN.	MR. J. ROBERTSON.

MR. ROBERTSON, *Convener.*

COMMITTEE ON PAPERS.

LORD BLYTHSWOOD.	MR. BARRETT.
MR. MACGREGOR CHALMERS.	PROFESSOR BARR.
MR. GILBERT THOMSON.	PROFESSOR HENDERSON.
DR. TURNER.	MR. PATON.
DR. MACLEAN.	MR. ROBERTSON.
MR. HANDASYDE DICK.	MR. J. F. CAMPBELL.
DR. COLVILLE.	MR. A. V. LOTHIAN.
PROFESSOR SMART.	DR. FERGUS.

DR. FERGUS, *Convener.*

SCIENCE LECTURE TRUST AND GRAHAM MEDAL FUND COMMITTEE.

PROFESSOR M'KENDRICK.	PROFESSOR FERGUSON.
PROFESSOR BOWER.	PROFESSOR HENDERSON.
PROFESSOR BARR.	MR. FALCONER.
DR. M. MACLEAN.	MR. PATON.
DR. FERGUS.	MR. J. F. CAMPBELL.

DR. MACLEAN, *Convener.*

HOUSE COMMITTEE.

Consisting of Members of the Philosophical Society and of the Institution of Engineers and Shipbuilders in Scotland.

Institution of Engineers and Shipbuilders in Scotland.	*Philosophical Society.*
MR. ROBERT CAIRD.	DR. FERGUS.
MR. A. S. BIGGART.	MR. G. THOMSON.
MR. H. A. MAVOR.	MR. MANN.
MR. JAS. GILCHRIST.	MR. ROBERTSON.
PROFESSOR A. BARR.	MR. J. F. CAMPBELL.
MR. E. H. PARKER *(Secretary).*	

ADDITIONS TO THE LIBRARY.

Donations, in addition to the Works received in Exchange from the Societies, &c., named on pp. 346-355.

By Donation.

Twenty-eighth Annual Report on the Operations of the Sanitary Department of the City of Glasgow, 1897-98. From Mr. Peter Fyfe.

Houses Let in Lodgings and Farmed-out Houses, Bye-laws. Pamphlet. 1898. From Mr. Peter Fyfe.

Bye-laws for Common Lodging-houses in Glasgow. Pamphlet. 1898. From Mr. Peter Fyfe.

Maori - English Lexicon, being a comprehensive Dictionary of the New Zealand Tongue. By W. Colenso. Part 1. Wellington, 1898. From the Author.

General Report on the work carried on by the Geological Survey of India, 1897, and continued, Calcutta. From the Survey.

Review and Bibliography of the Metallic Carbides. By J. A. Mathews. From Smithsonian Miscellaneous Collections. Vol. XXXVIII.

Catalogue of Earthquakes on the Pacific Coast, 1769-1897. By E. S. Holden. From Smithsonian Miscellaneous Collections. Vol. XXXVII.

Institution of Civil Engineers—Report of a Committee on the Thermal Efficiency for Steam Engines, 1898.

From Kongelige Norske Frederik's Universitatet—

Fauna Norvegiæ. Baud I. Beskrivelse af de Hidtil Kjendte Norske arter af underordnerne Phyllocarida og Phyllopoda, ved G. O. Sars. 4° Christiana, 1896.

Undersogelser over den Kutane Auæsthesi ved multipel Nevrit og Tabes Dorsalis, af Chr. Leegaard.

Bidrag til studiet of rakit Tilligemed en del oplysninger om almuens behandling af denne Sygdom, af Axel Johannessen.

Tuberkulosens Exantemer, af C. Boeck.

Études sur la Dyssymétrie Morphologique et Fonctionnelle chez: L'homme et les vértébrés supérieurs, af G. A. Guldberg.

Om apostolatets begreb og oprindelse, af Sigurd Odland.

Norske communers retsforfatning, for 1837, af T. H. Aschehoug.

From Messrs. Kegan, Paul, Trench, & Co.—

Report of the First Meeting of the Australasian Association for the Advancement of Science, held at Sydney, N.S.W., in Sept., 1888.

From Instituto Geológico de Mexico—
Buletin No. 10, Bibliografia y Minera de la Republica Mexicana.

From Royal Societies Club—
Foundation and Objects, Rules and Bye-laws, List of Members. Small 4to. 1897.

From Dr. Freeland Fergus—
Conférence Internationale consernant les Services Sanitaries et l'hygiène des Chemins de Fer, et de la Navigation. 2nd Session. Bruxelles, 1897.

From Kongliga Vetenskaps och Vitterhets Samhället, Goteborg—
Handlingar, Fjärde foljden, Häft I. 1898.

From the Astronomer Royal—
Report of Her Majesty's Astronomer at the Cape of Good Hope, 1897.

From Smithsonian Institution—
Catalogue of Scientific and Technical Periodicals, 1665-1895. By H. C. Bolton. 2nd Edition. Being Vol. XL., Smithsonian Miscellaneous Collections, 1897.

From Glasgow and West of Scotland Technical College—
Reports on Experiments on the Manuring of Oats, Hay, Turnips, and Potatoes. Pamphlet. 1898.

From the Government of Ontario—
Description of the Province of Ontario—Political Institutions, Natural Resources, Attractions for Tourist, Sportsman, and Settler. Toronto, 1897.

From Mr. W. Lang—
Inaugural Addresses by Lords Rectors of the University of Glasgow, in which are prefixed an historical sketch and account of the present state of the University. Glasgow, 1839.

From the Chartered Accountants of Scotland—
Official Directory for 1898.

From Mr. J. G. A. Baird—
Revenue and Expenditure, England, Scotland, and Ireland, Return of, for 1897.

From Dr. James Finlayson—
Mounted Photograph of Lord Lister.
Last Will and Testament, with the Inventory of the Estate, of Master Peter Lowe, Founder of the Faculty of Physicians and Surgeons, Glasgow. By James Finlayson. Reprinted from the Glasgow Medical Journal, 1898.

From Royal Geographical Society—
Antartic Exploration: a Plea for a National Expedition. Pamphlet. 1898.

From Dr. Thomas Muir—
History of South Africa under the Administration of the Dutch East India Company, 1652-1795. By G. M. Theal. 2 vols. 1897.

From Geological Survey of Scotland—
Sheet No. 36, 1″ scale—Banchory.

From Smithsonian Institution—
An Investigation on the Influence upon the Vital Resistance of Animals to the Micro-organisms of Disease brought about by a prolonged sojourn in an impure atmosphere. By D. H. Bergey. Smithsonian Miscellaneous Collections. Vol. XXXIX., No. 1135.
A Determination of the Ratio (γ) of the Specific Heats at Constant Pressure and at Constant Volume for Air, Oxygen, Carbon Dioxide, and Hydrogen. By O. Lummer and E. Pringhsheim. Smithsonian Contributions to Knowledge. Vol. XXIX., No. 1126.

From the Library of the Legislative Assembly and Bureau of Statistics, Victoria, B.C.—
Compendium of the Year Book of British Columbia and Manual of Provincial Information. By R. E. Goswell. 1897.

From Geological Survey of New South Wales—
Descriptions of the Palæozoic Fossils of New South Wales. By L. G. De Koninck. Translated by T. W. E. David. 4to. Sydney, 1898.

From the Author—
Replica di Krupp alla protesta del Signor Bashforth. Translated, with notes. By Francis Bashforth. Cambridge, 1898.

From Volta Bureau, Washington—
The Difference between the Two Systems of Teaching Deaf-mute Children the English Language. Pamphlet. Washington, 1898.

From University of Toronto—
The Gametophyte of Botrychium Virginianum. By E. C. Jeffrey. Biological Series, No. 1. 1898.
Space—Threshold of Colours and its Dependence on Contrast Phenomena. By W. B. Lane. Psychological Series, No. 1. 1898.

From Mr. Paul Rottenburg—
Gedanken und Erinnerungen von Fürst Bismark. 2 vols. Stuttgart, 1898.

From Wisconsin Geological and Natural History Survey—
Forestry Conditions of Northern Wisconsin. By F. Roth. Bulletin No. 1, Economic Series, No. 1, 1898 and continued. Madison.
Instinct and Habits of the Solitary Wasps. By G. W., and Elizabeth Peckham. Bulletin No. 2, Scientific Series, No. 1, 1898 and continued. Madison.

From the Author—
The Last Link: Our Present Knowledge of the Descent of Man. By Ernst Haeckel. With Notes and Biographical Sketches by Hans Gadow. 1898.

From the Geological Survey of India—
A Manual of the Geology of India. By V. Ball. Economic Geology. Second Edition. Revised in Parts. Part 1, Corundum. By T. H. Holland. Calcutta, 1898.

From the Librarian, Fulham Public Library—
Annual Report, 1898.

From the Author—
Report of the City of Glasgow Fever and Smallpox Hospitals for 1898. By Dr. Alex. Johnston.

From the Cleveland Institution of Engineers—
Measurement of High Temperatures. By T. W. Waller. Pamphlet. 1899.

From the Royal Geographical Society—
Year-book and Record for 1899.

From the Trustees of the Hunterian Coin Catalogue Fund, University of Glasgow—
Catalogue of Greek Coins in the Hunterian Collection, University of Glasgow. Vol. I. Italy, Sicily, Macedon, Thrace, and Thessaly. By George Macdonald. 4to. Glasgow, 1899.

From the Author—
Housing of the Labouring Classes. By Peter Fyfe. Pamphlet. 1899.

From Geological Survey of Scotland—
Maps, 1 inch to the mile, Nos. 13 and 15.
Maps, 1 inch to the mile, revised, Nos. 7, 40, 57, 67.

From the Author—
Adulteration of Dairy Produce. By R. H. Wallace. Pamphlet. Edinburgh, 1898.

From Robert Park, M.D.—
University Magazine and Free Review. Edited by Democritus. Vol. X., 1898.

From Greenock Philosophical Society—
Steam Speeds at Sea. By Sir N. Barnaby, being the Watt Anniversary Lecture for 1899. Pamphlet.

From the Author—
Japanese Notices of European Political Economy, being a Summary of a voluminous Report upon that subject forwarded to the Japanese Government. By T. Makato. Pamphlet. Philadelphia, 1899.

From the Authors—
Some Chemical Properties of Scotch Coal. By W. C. Anderson and James Roberts (Reprinted from the Journal of the Society of Chemical Industry, November, 1898). 4to. Pamphlet.

From the Royal Society—
Sheets A 3, A 4, B 3, B 4, C 5, and D 6 of the International Geological Congress Map of Europe.

From the Smithsonian Institution—
Bolton, H. C. A Select Bibliography of Chemistry. 1492-1897. First Supplement. Smithsonian Miscellaneous Collections. Vol. XXXIX., No. 1170. Washington, 1899.

From the Compiler—

List of the Principal Writings of the late Professor Coats, M.D. Compiled by Dr. T. K. Monro. Glasgow Medical Journal, April, 1899. Pamphlet.

From the Berwickshire Naturalists' Club—

Session Book of Bonckle sinne the admission of Mr. George Trotter to the said Church, and the Register of Marriages and Baptisms of the Parish, 1684-1690. Transcribed and annotated by James Hardy. Pamphlet. Alnwick, 1899.

From Mr. John Napier—

Hedin, Sven. Through Asia. 2 vols. 1898.

Curzon, Lord. The Pamirs and the Source of the Oxus. Revised and reprinted from the Geographical Journal, 1896.

From the Author—

Annual Report upon the Health and Sanitary Condition of the County of Ayr, 1898. By Dr. C. R. Macdonald.

From the Author—

Kunstfomen der Natur. By Ernst Haeckel. Folio. Leipsig, 1899.

From the Author—

On the Fluted Vibrations of a Circular Vortex Ring with a Hollow Core. By Dr. H. S. Carslaw. From Proceedings of the London Mathematical Society, Vol. XXVIII. Pamphlet.

Note on the Transformations of the Equations of Hydrodynamics. By Dr. H. S. Carslaw. From Proceedings of the Edinburgh Mathematical Society, Vol. XVI., 1897-98. Pamphlet.

Some Multiform Solutions of the Partial Differential Equations of Physical Mathematics and their Applications. By Dr. H. S. Carslaw. From Proceedings of the London Mathematical Society, Vol. XXX. Pamphlet.

From Glasgow University Court—

Roll of the Graduates of the University of Glasgow from 31st Dec., 1727, to 31st Dec., 1898, with Short Biographical Notes. Compiled by W. Innes Addison. 4to. Glasgow, 1898.

By Purchase.

Palæontographical Society's Publications:—

British Palæozoic Phyllopoda. Part 3.

British Carboniferous Lamellibranchiata. Part 3.

Inferior Oolite Ammonites of the British Isles. Part 10.

Devonian Fauna of the South of England. Vol. III. Part 3.

Cajori, F. History of Mathematics. 1897.

Catalogue of Scientific Papers, 1874-1883. Vol. X. 1895.

Cauchy, D'Augustin, Œuvres Complétes. Vol. II. 1899.

Colgan, N., and R. W. Scully. Contributions toward a Cybele Hibernica, being Outlines of the Distribution of Plants in Ireland. 2nd edition. Dublin, 1898.

Jahres-Beright über die leisiungen Chemischen Technologie. General Register. Band 31-40. Leipzig, 1898.

Krausse, A. China in Decay: a Handbook to the Far Eastern Question. 1898.

Lee, Sydney. Life of William Shakespeare. 3rd edition. 1898.

Mahan, A. T. Life of Nelson: the Embodiment of the Sea Power of Great Britain. 2 vols. 1898.

Mahan, A. T. The Influence of Sea Power upon the French Revolution and Empire, 1793-1812. 2 vols. 1892.

Murray's New English Dictionary—
Crouchmas—Cyeth. D—Deprivation, Distrustfully—Dziggelai. E—Every. F—Fang, Field—Fish, Flexuosity—Fryz. G—Germanizing. H—Heel.

Philosophical Transactions of the Royal Society of London. Vol. CXCI., Series A. 1898.

Sexton, A. H. Fuel and Refractory Materials. 1897.

Smith, G. A. Life of Henry Drummond. 1899.

Sonnenschein, W. S. Reader's Guide to Contemporary Literature, being the First Supplement to the Best Books, with complete Authors and Subjects Index. 4to. 1895.

Who's Who? an Annual Biographical Dictionary. Edited by D. Sladen. 1899.

Wright, J. English Dialect Dictionary. Parts 6 and 7. D—Ezob.

Buckler, W. Larvæ of the British Butterflies and Moths. Edited by G. T. Porritt. Vol. VIII. 1899.

Hazell's Annual, 1899.

Kingsley, Mary H. West African Studies. 1899.

Philosophical Transactions of the Royal Society of London. Vol. CXC., B. 1898.

Renwick, R. Abstract of Protocols of the Town-Clerks of Glasgow. Vols. VI. and VII. 1568-76. 1898.

Spencer, H. The Principles of Ethics. Vol. I. 1892.

Allen, A. H. Commercial Organic Analysis. 2nd Edition. Vol. IV. Proteids and Albuminous Principles. 1898.

Argyll, Duke of. Organic Evolution Cross-examined: or, some suggestions on the great secret of Biology. 1898.

Brunn, D. Cave Dwellers of Southern Tunisia: recollections of a sojourn with the Khalifa of Matmata. Translated by L.A.E.B. 1898.

Caird, John. University Addresses; being Addresses on Subjects of Academic Study delivered to the University of Glasgow. 1898.

Heden, Sven. Through Asia. 2 vols. 1898.

Hodder, E. Sir George Burns: his Times and Friends. 1890.

Kilpatrick, J. A. Literary Landmarks of Glasgow. 1898.

Landor, A. H. S. In the Forbidden Land: an account of a journey in Tibet, capture by the Tibetan authorities, imprisonment, torture, and ultimate release. 2 vols. 1898.

Murray, James. Kilmalcolm: a Parish History, 1100-1898. 4to. Paisley, 1898.

Peary, R. E. Northward over the Great Ice, 1886 and 1891-97. 2 vols. 1898.

Threlfall, R. Laboratory Arts. 1898.

Joubert, M. Elementary Treatise on Electricity and Magnetism. Translated and revised by J. C. Foster and E. Atkinson, 1896.

Œuvres Complètes de Laplace. Tome XII. 4to. Paris, 1898.

Dictionary of National Biography. Vols. LV.-LIX. Stow—Watkins.

L'Année Scientifique et Industrielle. 1897.

Russell, B. A. W. Essay on the Foundations of Geometry. Cambridge, 1897.

Statesman's Year-Book, 1899.

Ewing, P. Glasgow Catalogue of Native and Established Plants. 2nd edition. 1899.

Jahres-Bericht über die leisiungen Chemischen Technologie. 1898.

Dewar, A. R. From Matter to Man: a New Theory of the Universe. 1898.

Lecky, W. E. H. History of the Rise and Influence of the Spirit of Rationalism in Europe. New edition. 2 vols. 1897.

THE PHILOSOPHICAL SOCIETY EXCHANGES WITH THE FOLLOWING SOCIETIES, &c.:—

AFRICA.

Cape Town—
South African Philosophical Society.
Cape of Good Hope Observatory. The Astronomer Royal.

AUSTRALIA.

Brisbane—
Royal Geographical Society of Australasia (Queensland Branch).

Melbourne—
Royal Observatory Library.
Patent Office.
Royal Society of Victoria, Victoria Street.

Sydney—
Geological Survey, Department of Mines. The Honourable the Minister for Mines.
Royal Geographical Society of Australasia (New South Wales Branch).
Royal Society of New South Wales, 5 Elizabeth Street, North.
Technological Museum.

BELGIUM.

Brussels—
Académie Royale des Sciences.
Observatoire Royale.
Société Malacologique de Belgique.

Liège—
Société Royale des Sciences.

BRAZIL.

Rio-Janeiro—
Museu Nacional do Rio de Janeiro.

CANADA.

Halifax—
Nova Scotian Institute of Science.

Hamilton (Ont.)—
Hamilton Association.

London (Ont.)—
Entomological Society of Ontario.

Montreal—
Canadian Society of Civil Engineers, 112 Mansfield Street.

Ottawa—
Geological Survey of Canada, Sussex Street.
Royal Society of Canada.

Toronto—
Canadian Institute, 58 Richmond Street, East.

Victoria (B.C.)—
Library of the Legislative Assembly.

Winnipeg—
Manitoba Historical and Scientific Society.

CHINA.

Hong Kong—
Hong Kong Observatory.

ENGLAND AND WALES.

Barnsley—
Midland Institute of Mining, Civil, and Mechanical Engineers, Elden Street.

Bath—
Bath Natural History and Antiquarian Field Club.

Birmingham—
Philosophical Society, Medical Institute, Edmund Street.

Bristol—
Bristol Naturalists' Society. Dr. C. K. Rudge, Ashgrove House, 145 White Ladies' Road, Clifton.

Cambridge—
Philosophical Society, New Museum.
University Library. The Curator.

ENGLAND AND WALES—*continued.*

Cardiff—
Cardiff Naturalists' Society, 44 Loudoun Square.
South Wales, Institute of Engineers, Park Place.

Chelmsford—
Essex Field Club. Hon. Librarian.

Falmouth—
Royal Cornwall Polytechnic Society.

Folkestone—
Folkestone Natural History Society, 98 Dover Road.

Greenwich—
Royal Observatory. The Astronomer Royal.

Leeds—
Leeds Philosophical and Literary Society.

Leicester—
Leicester Literary and Philosophical Society.

Liverpool—
Geological Society, Royal Institution, Colquitt Street.
Historic Society of Lancashire and Cheshire, Royal Institution.
Literary and Philosophical Society.
Liverpool Engineering Society, Royal Institution, Colquitt Street.
Liverpool Naturalists' Field Club, Royal Institution, Colquitt Street.

London—
Anthropological Institute, 3 Hanover Square.
British Association for the Advancement of Science, Burlington House.
British Museum. The Superintendent, Copyright Office.
Chemical Society, Burlington House.
India-rubber and Gutta-percha and Electrical Trades Journal, 19 Wilson Street, E.C.
Institution of Civil Engineers, 25 Great George Street, Westminster.
Institution of Junior Engineers, 47 Fentiman Road, Clapham Road.
Institution of Mechanical Engineers, Storey's Gate, St. James' Park, Westminster.
Middlesex Hospital, Berners Street.
Patent Office Library, 25 Southampton Buildings, Chancery Lane.
Pharmaceutical Society, 17 Bloomsbury Square.
Royal Geographical Society, 1 Saville Row.
Royal Institute of British Architects, 9 Conduit Street, Hanover Square.
Royal Institution of Great Britain, Albermarle Street, Piccadilly, W.
Royal Meteorological Society, 22 Great George Street, Westminster.
Royal Photographic Society, 5A Pall Mall, East.
Royal Society, Burlington House.
Royal Statistical Society, 9 Adelphi Terrace, Strand.
Society of Arts, John Street, Adelphi.
Society of Biblical Archæology, 37 Great Russell Street, Bloomsbury.
Society of Chemical Industry, Palace Chambers, 9 Bridge Street, Westminster.

ENGLAND AND WALES—*continued.*

London (*continued*)—
Society of Engineers, 17 Victoria Street, Westminster.
Society of Psychical Research, 19 Buckingham Street.
Engineering. The Publisher, 35 Bedford Street, Strand.
Industries and Iron, 39 and 40 Shoe Lane.

Manchester—
Manchester Association of Engineers, Grand Hotel, Aytoun Stree .
Geographical Society, 16 St. Mary's Parsonage.
Literary and Philosophical Society of Manchester, 36 George Street.

Middlesborough—
Cleveland Institution of Engineers.

Newcastle-upon-Tyne—
North-East Coast Institution of Engineers and Shipbuilders, 4 St. Nicholas Buildings.
North of England Institute of Mining and Mechanical Engineers, Neville Hall.

Oxford—
Bodleian Library.

Truro—
Royal Institution of Cornwall.

Watford—
Hertfordshire Natural History Society and Field Club, Herga. D. Hill, Hon. Librarian.

Welshpool—
Powys Land Club. The Secretaries, Museum and Library, Salop Road.

FRANCE.

Bordeaux—
Société des Sciences Physiques et Naturelles.

Marseilles—
Faculté des Sciences de Marseille.

Paris—
École Polytechnique. The Director.
Observatoire Météorologique Central de Montsouris.

GERMANY.

Berlin—
Deutsche Chemische Gesellschaft.
Deutsche Kolonial Verein.
Königliche Preussische Akademie der Wissenschaften.

Bremen—
Geographische Gesellschaft.

Giessen (Hesse)—
Oberhessische Gesellschaft für Natur-und Heilkunde.

Griefswald (Prussia)—
Geographische Gesellschaft.

GERMANY—*continued.*

Halle (Prussia)—
Verein für Erdkunde.
Kaiserliche Leopoldino—Carolinische Deutsche Akademie der Naturforscher.

Hamburg—
Geographische Gesellschaft.

INDIA.

Calcutta—
Geological Survey of India.

IRELAND.

Belfast—
Belfast Naturalists' Field Club, Museum, College Square, North.
Natural History and Philosophical Society, Museum, College Square. North.

Dublin—
Royal Dublin Society, Leinster House.
Royal Irish Academy, 19 Dawson Street.
Trinity College Library.

ITALY.

Milan—
Reale Instituto di Lombardo di Scienze, Lettere, ed Arti.

JAPAN.

Tokio—
Imperial University of Tokio, Science College.
Seismological Society of Japan. John Milne, Shide Hill House, Shide, Newport, Isle of Wight.
Imperial University of Tokio.

MEXICO.

Mexico—
Observatorio Astronómico Nacional de Tacubaya.
Sociedad Cientifica "Antonio Alzate."
Academia Mexicana de Sciencias.

NEW ZEALAND.

Wellington—
Colonial Museum.

NETHERLANDS.

Amsterdam—
Académie Royale des Sciences à Amsterdam.

Harlem—
Société des Sciences á Harlem.

Teyleryan Library.

Leyden—
Kon. Nederlandisch Aardrijkskundig Genootschap.

NORWAY.

Christiania—
Kongelige Norske Frederiks Universitet.

PORTUGAL.

Lisbon—
Academia Real das Sciencias.

ROUMANIA.

Bucharest—
Societatii de Sciinte Fizice.

RUSSIA.

Kazan—
Imperial Kazan University.

St. Petersburg—
Académie Impériale des Sciences.
Russian Chemical Society of the University of St. Petersburg.

SCOTLAND.

Aberdeen—
Philosophical Society, 147 Union Street.

Edinburgh—
Advocates' Library.
Botanical Society of Edinburgh, Royal Botanic Garden.
Geological Society, 5 St. Andrew Square.
Highland and Agricultural Society of Scotland, 3 George IV. Bridge.
Royal Physical Society, 18 George Street.
Royal Scottish Geographical Society, Queen Street.
Scottish Meteorological Society, 122 George Street.
Royal Scottish Society of Arts, 117 George Street.
Royal Society, The Mound, Princes Street.

Glasgow—
Archæological Society, 88 West Regent Street.
Baillie's Institution Free Library, Miller Street.
Faculty of Physicians and Surgeons of Glasgow, 242 St. Vincent Street.
Geological Society, 207 Bath Street.
Glasgow and West of Scotland Technical College Library, 38 Bath Street.
Institution of Engineers and Shipbuilders in Scotland, 207 Bath Street.
Mitchell Library, Miller Street.
Natural History Society of Glasgow, 207 Bath Street.
Stirling's Public Library, Miller Street.

Greenock—
Philosophical Society.

Hamilton—
Mining Institute of Scotland.
Public Library.

Kelso—
Berwickshire Naturalists' Club. Rev. George Gunn, Stickhill Manse.

Paisley—
Public Library.

SWEDEN.

Upsala—
Royal University Library.

Stockholm—
Kongliga Svenska Vetenskaps-Akademie.

TASMANIA.

Hobart—
Royal Society of Tasmania.

UNITED STATES.

Austin (Texas)—
Texas Academy of Science.

Baltimore—
Johns Hopkins University.

Boston—
American Academy of Arts and Sciences.
Public Library, Copley Square.
Boston Society of Natural History.

Cincinnati—
Ohio Mechanics' Institute.

Colorado Springs—
Colorado Scientific Society.

Davenport (Iowa)—
Academy of Natural Sciences.

Des Moines (Iowa)—
Iowa Geological Survey.

Indianopolis (Ind.)—
Indiana Academy of Science.

Lawrence (Kansas)—
Kansas University Quarterly.

Madison—
Madison Geological and Natural History Society.
Washburn Observatory.

Minneapolis—
Geological and Natural History Society of Minnesota.
Indiana Historical and Scientific Association.

Newhaven (Conn.)—
Connecticut Academy of Arts and Sciences.

New York—
American Geographical Society, 11 West Twenty-ninth Street.
American Museum of Natural History, Central Park, Seventy-seventh Street.
American Society of Civil Engineers, 220 West Twenty-seventh Street.
New York Academy of Sciences, Columbia University, West 116th Street.
New York Public Library, 40 Lafayette Place.
School of Mines, Columbia College. The Associate Editor.

Philadelphia—
Academy of Natural Science of Philadelphia.
Alumni Association, 1829 North Eighth Street.
American Pharmaceutical Association.
American Philosophical Society. The Hon. Secretaries, 104 South Fifth Street.

UNITED STATES—*continued.*

Philadelphia (*continued*)—
Franklin Institute, 15 South Seventh Street.
Numismatic and Antiquarian Society of Philadelphia.
Wagner Free Institute of Science, corner of Seventeenth Street and Montgomery Avenue.

Portland (Maine)—
Portland Society of Natural History, Elm Street.

Rochester (N. Y.)—
Rochester Academy of Science. Corresponding Secretary.

St. Louis—
Academy of Science of St. Louis.
Public School Library.

San Francisco (California)—
California Academy of Sciences.

Topeka (Kansas)—
Kansas Academy of Science.

Trenton (N. J.)—
Trenton Natural History Society.

Washington—
Bureau of Education (Department of the Interior).
Bureau of Ethnology.
Smithsonian Institution.
United States Geological Survey.
United States National Museum (Department of the Interior).
United States Naval Observatory.

LIST OF PERIODICALS.

(Those received in exchange are indicated by an asterisk.)

WEEKLY.

Academy.
Architect.
Athenæum.
British Architect.
British Journal of Photography.
Builder.
Builders' Journal.
Building News.
Chemical News.
Comptes Rendus.
Dingler's Polytechnisches Journal.
Economist.
Electrical Review.
Electrician.
Engineer.
*Engineering.
English Mechanic.
*India-rubber and Gutta-percha and Electrical Trades Journal.
*Industries and Iron.
*Journal of the Society of Arts.
Journal of Gas Lighting.
La Nature.
Nature.
Notes and Queries.
*Pharmaceutical Journal.
Publishers' Circular.
Scientific American and Supplement.

FORTNIGHTLY.

Annalen der Chemie (Liebig's).
*Berichte der Deutschen Chemischen Gesellschaft.
Journal für Praktische Chemie (Erdmann's).
Zeitschrift für Angewandte Chemie.

MONTHLY.

*American Chemical Journal.
Analyst.
Annalen der Physik und Chemie.
Annales de Chimie et de Physique.
Annales de l'Institut Pasteur.
Annales des Ponts et des Chaussées.
Annales des Sciences Naturelles. Botanique.
Annales des Sciences Naturelles. Zoologie.
Annals and Magazine of Natural History.
Antiquary.
Beiblätter zu den Annalen der Physik und Chemie.
Bookseller.
Bulletin de la Société Chimique de Paris.
Bulletin de la Société d'Encouragement.
Bulletin de la Société Géologique de France.
Bulletin de la Société Industrielle de Mulhouse.
*Bulletin Mensuel de l'Observatoire de Montsouris.
*Canadian Entomologist.
*Deutsche Kolonialzeitung.
Entomologist.
Entomologists' Monthly Magazine.
*Geographical Journal.
Geological Magazine.
*Johns Hopkins University Circulars.
Journal de Pharmacie et de Chimie.
Journal of Botany.
*Journal of the Chemical Society.
*Journal of the Franklin Institute.
*Journal of the Photographic Society.
*Journal of the Society of Chemical Industry.
London, Edinburgh, and Dublin Philosophical Magazine.
*Monatsbericht der Königlich Preussischen Akademie der Wissenschaften zu Berlin.
Monthly List of Official and Parliamentary Papers.
Petermanns Mitteilungen.
Polytechnic Bibliothek.
*Proceedings of Royal Society of London.
*Proceedings of the Society of Biblical Archæology.
Revue Universelle des Mines.
*Royal Astronomical Society's Monthly Notices.
Sanitary Journal.
Science Gossip.
*Scottish Geographical Magazine.
*Travel.
Zoologist.

QUARTERLY.

Annales des Mines.
Annals of Botany.
Annals of Scottish Natural History.
*Archives Nèerlandaises des Sciences Exactes et Naturelles.
*Bulletin of the American Geographical Society.
Economic Journal.
Forschritte der Mathematik.
Journal of Anatomy and Physiology.
*Journal of the Anthropological Institute of Great Britain.
*Journal of Manchester Geographical Society.
Journal of the Royal Agricultural Society of England.

Journal of the Royal Microscopical Society.
*Journal of the Royal Statistical Society.
*Journal of the Scottish Meteorological Society.
*Kansas University Quarterly.
Mind: a Quarterly Review of Psychology and Philosophy.
Quarterly Journal of Economics.
Quarterly Journal of Geological Society.
Quarterly Journal of Microscopical Science.
*Quarterly Journal of Royal Meteorological Society.
Quarterly Journal of Pure and Applied Mathematics.
Reliquary and Illustrated Archæologist.
*School of Mines Quarterly.
*Sociedad Cientifica "Antonio Alzate."
Zeitschrift für Analytische Chemie.

ANNUALLY.

Association Française pour l'Avancement des Sciences.
Cantor's Vorlesungen über Geschichte der Mathematik.
Dictionary of National Biography.
Hazell's Annual.
Jahres-Bericht Chemischen Technologie.
Journal of Iron and Steel Institute.
L'Année Scientifique et Industrielle.
Murray's English Dictionary.
Œuvres Complètes de Laplace.
Œuvres Complètes de Cauchy.
Palæontographical Society's Publications.
Philosophical Transactions, Royal Society of London.
Ray Society's Publications.
Reportorium der Technischen Journal—Litterature.
Statesman's Year-Book.
Symons's British Rainfall.
Who's Who?
Wright's English Dialect Dictionary.

LIST OF MEMBERS

OF THE

PHILOSOPHICAL SOCIETY OF GLASGOW.

FOR 1898-99.

HONORARY MEMBERS.

(Limited to Twenty.)

WITH YEAR OF ELECTION.

FOREIGN.

Rudolph Albert von Kölliker, Würtzburg. 1860
Ernst Heinrich Hæckel, Jena. 1880
Georg Quincke, Heidelberg. 1890

AMERICAN AND COLONIAL.

Robert Lewis John Ellery, F.R.A.S., Victoria, Australia. 1874
Sir John William Dawson, LL.D., F.R.S., Principal of M'Gill College, Montreal. 1883
Thomas Muir, M.A., LL.D., F.R.S.E., Superintendent General of Education, Cape Colony. 1892
Professor S. P. Langley, LL.D., D.C.L., Secretary of the Smithsonian Institution, Washington, U.S.A. 1895

BRITISH.

Sir Joseph Dalton Hooker, K.C.B., K.C.S.I., M.D., D.C.L., LL.D., F.R.S., The Camp, Sunningdale. 1874
Herbert Spencer, care of Messrs. Williams & Norgate, 14 Henrietta street, Covent Garden, London. 1879
Rev. John Kerr, LL.D., F.R.S., Glasgow. 1885
Sir George Gabriel Stokes, Bart., M.A., LL.D., D.C.L., F.R.S., Lensfield cottage, Cambridge. 1887
F. Max Müller, M.A., Professor of Comparative Philology, University of Oxford, Norham gardens, Oxford. 1889
The Right Hon. Lord Rayleigh, M.A., D.C.L., LL.D., *Sec.*R.S., London, Terling place, Witham, Essex. 1890
The Right Hon. Lord Lister, LL.D., D.C.L., *P.*R.S., 12 Park crescent, Portland place, London, W. 1895
Sir Archibald Geikie, LL.D., D.Sc., F.R.S., F.R.S.E., F.G.S., Director-General of the Geological Survey of the United Kingdom, 10 Chester terrace, Regent's Park, London, N.W. 1895
The Right Hon. Lord Kelvin, G.C.V.O., LL.D., D.C.L., F.R.S., Professor of Natural Philosophy, University of Glasgow 1896
(*Ordinary Member, 1846 till 1896.*)
James B. Russell, LL.D., M.D., 49 Braid Street, Morningside, Edinburgh, *Honorary Vice-President.* 1899

CORRESPONDING MEMBERS.

WITH YEAR OF ELECTION.

A. S. Herschel, M.A., D.C.L., F.R.S., F.R.A.S., Hon. Professor of Experimental Physics in the Durham College of Science, Newcastle-on-Tyne; Observatory House, Slough, Bucks. 1874
Thomas E. Thorpe, Ph.D., F.R.S., Professor of Chemistry in Royal College of Science, London. 1874
John Aitken, F.R.S., F.R.S.E., Ardenlea, Falkirk. 1883
Alex. Buchan, M.A., LL.D., F.R.S.E., F.R.S., Secretary to the Scottish Meteorological Society, 122 George street, Edinburgh. 1883
James Dewar, M.A., F.R.S., F.R.S.E., M.R.I., Jacksonian Professor of Physics, University of Cambridge, and Professor of Chemistry in the Royal Institution of Great Britain, 1 Scroope terrace, Cambridge. 1883
Stevenson Macadam, Ph.D., F.R.S.E., Lecturer on Chemistry, Surgeons' Hall, Edinburgh. 1883
Joseph W. Swan, M.A., F.R.S., Lauriston, Bromley, Kent. 1883
William Milne, M.A., B.Sc., F.R.S.E., Department of Public Education, Cradock, Cape Colony. 1894

ORDINARY MEMBERS.

WITH YEAR OF ENTRY.

* *Denotes Life Members.*

Adam, Stephen, 199 Bath street. 1896
*Adam, Thomas, F.S.I., 27 Union street. 1892
Adams, William, Makerstoun, Bearsden. 1891
Addison, W. H., Superintendent, Deaf and Dumb Institution. 1895
*Agar, Thomas F., Argentine Consul-General, 7 Royal Bank place. 1896
Aikman, C. M., M.A., D.Sc., F.R.S.E., F.I.C., F.C.S., 128 Wellington street. 1886
Alexander, D. M., Marionville, Queen's drive. 1887
Alexander, G. W., M.A., 129 Bath street. 1893
Alston, J. Carfrae, 27 James Watt street. 1887
Anderson, Alexander, 157 Trongate. 1869
Anderson, David Blyth, 18 Park circus. 1897
Anderson, James, 168 George street. 1890
Anderson, John, 22 Ann street. 1884
Anderson, J. B. Mackenzie, M.B., 42 Lansdowne crescent. 1895
Anderson, R. T. R., 80 Seedhill rd., Paisley. 1889
Anderson, Robert, 44 Albert drive, Crosshill. 1887
Anderson, Robert, 76 Bath street. 1896
*Anderson, T. M'Call, M.D., Professor of Clinical Medicine in the University of Glasgow, 2 Woodside terrace. 1873
*Anderson, William, 284 Buchanan street. 1890
Anderson, W. F. G., 47 Union street. 1878
*Annan, J. Craig, 234 Sauchiehall street. 1888
Annandale, Charles, M.A., LL.D., 35 Queen Mary avenue. 1888
Arnot, James Craig, 162 St. Vincent street. 1869
*Arnot, J. L., 116 West Campbell st. 1890
Atkinson, J. B., 10 Foremount terrace, Partick. 1889

Bain, Andrew, 17 Athole gardens. 1890
Bain, Robert, 132 West Nile street. 1869
*Baird, J. G. A., M.P., Wellwood, Muirkirk. 1892
Ballantine, George, jun., 100 Union street. 1897
Balloch, Robert, Eamont lodge, Dowanhill. 1843
Balmain, Thos., 1 Kew terrace, Kelvinside. 1881
Barclay, A. J. Gunion, M.A., F.R.S.E., High School. 1893
Barclay, A. P., 133 St. Vincent street. 1890
Barclay, George, 6 Colebrooke ter. 1891
Barclay, James, 36 Windsor terrace. 1871
*Barr, Archibald, D.Sc., Professor of Civil Engineering and Mechanics in the University of Glasgow, Royston, Dowanhill, *Vice-President.* 1890
*Barr, James, C.E., I.M., F.S.I., 221 West George street. 1883
Barr, Thos., M.D., F.F.P.S.G., 13 Woodside place, W. 1879
Barrett, Francis Thornton, Mitchell Library. 1880

Bathgate, William, M.A., 13 Westbourne gardens. 1887
Bayne, A. Malloch, 13 Kelvin drive, Kelvinside. 1878
Beatson, George T., B.A. (Cantab.), M.D., 7 Woodside crescent. 1881
Becker, L., Ph.D., Professor of Astronomy in the University of Glasgow, The Observatory. 1895
Begg, Wm., 636 Springfield road. 1883
Beilby, George T., F.I.C., St. Kitts, Slateford. 1895
*Beith, Gilbert, 15 Belhaven terrace. 1881
*Bell, Henry, 39 Fitzjohn's avenue, Hampstead, London, N.W. 1876
Bell, Sir James, Bart., 101 St. Vincent street. 1877
Bell, James T., Northcote, Dowanhill. 1896
*Bell, John J., Northcote, Dowanhill. 1896
Bennett, Robert J., Alloway park, Ayr. 1883
Bergius, Walter, C.E., 77 Queen street. 1897
Bilsland, William, 28 Park circus. 1888
*Bishop, A. Henderson, Burncroft, Thorntonhall. 1896
Black, J. Albert, Duneira, Row. 1869
Black, Malcolm, M.D., 5 Canning place. 1880
*Blackie, J. Alexander, 17 Stanhope street. 1881
*Blackie, J. Robertson, 17 Stanhope street. 1881
Blackie, W. G., Ph.D., LL.D., F.R.G.S., 1 Belhaven terrace, Kelvinside. 1841
*Blackie, Walter W., B.Sc., 17 Stanhope street. 1886
Blair, G. M'Lellan, 2 Lilybank ter. 1869
Blair, J. M'Lellan, Williamcraig, Linlithgowshire. 1869
Blair, Matthew, 5 Hampton Court terrace. 1887
Blyth, James, M.A., F.R.S.E., Professor of Natural Philosophy, Glasgow and West of Scotland Technical College, 204 George street. 1881
*Blyth, Robert, 1 Montgomerie quadrant. 1885
*Blythswood, The Rt. Hon. Lord, Renfrew, *President*. 1885
*Borland, William, 142 St. Vincent street. 1895
Borthwick, James D., 46 Balshagray avenue, Partick. 1891
Bottomley, James T., M.A., D.Sc., F.R.S., F.R.S.E., F.C.S., Demonstrator in Natural Philosophy, University of Glasgow, 13 University gardens, Hillhead. 1880
Bottomley, Wm., C.E., 15 University gardens. 1880
Bower, F. O., D.Sc., M.A., F.R.S., F.L.S., Regius Professor of Botany in the University of Glasgow, 45 Kersland terrace. 1885
Boyd, John, Shettleston Iron-works, near Glasgow. 1873
Brodie, John Ewan, M.D., C.M., F.F.P.S.G., 5 Woodside place. 1873
Brodie, Wm. Brodie, M.B., C.M., Muirhead Demonstrator of Physiology, University of Glasgow. 1897
Brown, Alex., The Craigs, Carmunnock. 1896
*Brown, Hugh, 5 St. John's terrace, Hillhead. 1887
Brown, James, 76 St. Vincent street. 1876
*Brown, John, 11 Somerset place. 1881
Brown, Richard, Professor of Mercantile Law, St. Mungo's College, 138 W. George street. 1895
Brown, Robert, 19 Jamaica street. 1882
*Brown, Wm. Stevenson, 67 Washington street. 1886
*Brown, William, 165 W. George street. 1892
Browne, Richard, Beechholm, Queen's drive, Crosshill. 1893
Browne, Robert, B.Sc., 45 Washington street. 1893
Brownlie, J. Rankin, L.D.S. (Eng.), 220 West George street. 1892
Bruce, David, M.A., LL.B., Writer, 49 West George street. 1897
*Bryce, Robert, 82 Oswald street. 1886
Buchan, David W., Fairy Knowe, Cambuslang. 1896
Buchanan, Alex. M., A.M., M.D., Professor of Anatomy, Anderson's College Medical School, 98 St. George's road. 1876
Buchanan, George S., 85 Candleriggs. 1845
*Buchanan, Wm., Enderley, Bearsden. 1886
Burnet, John, F.R.I.B.A., I.A., 167 St. Vincent street. 1850
Burnet, John James, A.R.S.A., F.R.I.B.A., 18 University avenue. 1892
Burns, J., M.D., 15 Fitzroy place, Sauchiehall street. 1864
Burton, Thomas John, M.D. (Ed.), Lonsdale, Bearsden. 1896
Caird, Robert, F.R.S.E., 56 Esplanade, Greenock. 1898
*Caldwell, George B., Scotia Leather Works, Boden street. 1892
Cameron, Sir Charles, Bart., M.P., M.D., LL.D., Greenock. 1870

Cameron, H. C., M.D., 200 Bath street. 1873
100 *Campbell, Archibald, Springfield quay. 1895
*Campbell, J. A., LL.D., M.P., Stracathro, Brechin. 1848
*Campbell, James, 137 Ingram st. 1885
*Campbell, John Ferguson, 2 Holborn terrace, N., Kelvinside. 1892
Campbell, John MacNaught, C.E., F.Z.S., F.R.S.G.S., Kelvingrove Museum. 1883
105 Campbell, Malcolm, 18 Gordon street. 1894
*Campbell, Thomas, Maryhill Ironworks. 1894
Carlile, William W., Hailie, Largs, Ayrshire. 1897
Carmichael, Neil, M.D., C.M., F. F. P. S. G., Invercarmel, 23 Nithsdale drive, Pollokshields. 1873
Carslaw, Horatio S., M.A., Assistant to the Professor of Mathematics, University of Glasgow. 1898
110 Cassells, John, 62 Glencairn drive, Pollokshields. 1890
Cassells, Robert Dunlop, B.Sc., 62 Glencairn drive, Pollokshields. 1895
*Cayzer, Sir Charles W., M.P., 109 Hope street. 1886
Chalmers, A. K., M.D., D.P.H. (Camb.), 23 Kersland terrace. 1892
Chalmers, George, 13 Hamilton crescent, Partickhill. 1896
115 Chalmers, P. MacGregor, I.A., F.S.A.Scot., 95 Bath street. 1891
Chamen, W. A., Drumard, Partickhill road. 1898
Cherrie, James M., Clutha cottage, Tollcross. 1876
*Chisholm, Samuel, 4 Royal terrace, West, 1890
*Christie, Henry W., Levenfield house, Alexandria. 1892
120 Christie, John, Turkey-red Works, Alexandria, Dumbartonshire. 1868
Christison, George, 13 Cambridge drive. 1897
Chrystal, W. J., F.I.C., F.C.S., Shawfield Works, Rutherglen. 1882
Clark, John, Ph.D., F.I.C., F.C.S., 138 Bath street. 1870
Clark, John, 9 Wilton crescent. 1872
125 Clark, John, M.A., 2 Kersland st., Hillhead. 1897
*Clark, William, 125 Buchanan st. 1876
*Cleland, John, M.D., LL.D., D.Sc., F.R.S., Professor of Anatomy in the University of Glasgow. 1884
*Cochran, Robert, 7 Crown circus, Dowanhill. 1877
Coghill, Wm. C., 263 Argyle street. 1873
130 *Colquhoun, James, LL.D., 158 St. Vincent street. 1876
Colville, James, M.A., D.Sc., 14 Newton place. 1885
Combe, James Russell, 2 Royal crescent, Crosshill. 1895
Connell, Wm., Fairhill, Hamilton. 1870
Connell, William, jun., Coldstream, Cathkin road, Langside. 1897
135 Cooke-Taylor, R. W., 121 West Regent street. 1898
Copland, Wm. R., M.Inst.C.E., F.S.I., 146 West Regent street. 1876
Core, Wm., M.D., Medical Superintendent, Barnhill Hospital. 1891
Cormack, J. D., B.Sc., Lecturer in Electrical Engineering, University of Glasgow. 1898
Coste, Jules, French Consulate, 131 West Regent street. 1888
140 Costigane, John T., Limekilns house, East Kilbride. 1889
Costigane, William, Clifton hall, Albert drive, Pollokshields. 1890
Coubrough, A. Sykes, Parklea, Blanefield, Strathblane. 1869
Coulson, W. Arthur, 47 King street, Mile-end. 1888
Couper, James, Craigforth house, Stirling. 1862
145 Couper, Sinclair, Moore Park Works, Helen street, Govan. 1896
Cowan, M'Taggart, C.E., 53 Ashton terrace, Hillhead. 1876
Craig, T. A., C.A., 139 St. Vincent street. 1886
Cree, Thomas S., 21 Exchange square. 1869
Crichton, James, 201 Nithsdale road, Pollokshields. 1892
150 Crosbie, L. Talbot, Scotstounhill, Whiteinch. 1890
Cross, Alexander, M.P., 14 Woodlands terrace. 1887
*Crum, Walter G., Thornliebank. 1895
Crum, William G., Thornliebank. 1896
*Curphey, Wm. Salvador, Borva, Lenzie. 1883
155 Cuthbert, Alexander A., 14 Newton terrace. 1885
*Cuthbertson, Sir John N., LL.D., 29 Bath street. 1850
Cuthbertson, Thomas W., M.A., 25 Blythswood square. 1897

*Daly, James, 2 Prince's gardens. 1898
Dalziel, J. Kennedy, M.B., C.M., 196 Bath street. 1896
160 Dansken, A. B., 105 West George street. 1877
*Dansken, John, I.M., F.S.I., F.R.A.S., 241 West George street. 1876

Darling, Geo. E., 178 St. Vincent st. 1870
Deas, Jas., C.E., 7 Crown gardens, Dowanhill. 1869
Dempster, John, 7 Knowe terrace, Pollokshields. 1875
165 Dennison, William, C.E., 175 Hope street. 1876
*Dick, George Handasyde, 136 Buchanan street. 1887
*Dixon, A. Dow, 10 Montgomerie crescent, Kelvinside. 1873
Dixon, Walter, 164 St. Vincent st. 1893
Dobbie, A. B., M.A., 24 West Cumberland street. 1885
170 Donald, John, Townhead Public School. 1872
Donald, William J. A., South Exchange court. 1877
Dougall, Franc Gibb, 167 Canning st. 1875
Downie, John, Burnawn, Uddingston. 1898
Downie, Robert, jun., Carntyne Dye-works, Parkhead. 1872
175 Downie, Thomas, Hydepark Foundry. 1886
*Dreghorn, David, Smith st., Kinning Park. 1896
*Duncan, Eben., M.D., C.M., F.F.P.S.G., Queen's Park house, Langside road, *Hon. Vice-President.* 1873
Duncan, Hugh, M.A., LL.B., 175 West George street. 1895
Duncan, J. A., Glenlee, Bridge of Allan. 1896
180*Duncan, Robert, Whitefield Works, Govan. 1890
*Duncan, Walter, 137 W. George st. 1881
*Dunlop, Nathaniel, 25 Bothwell st. 1870
Dunn, Robert Hunter, 4 Belmont crescent. 1878
Dyer, Henry, M.A., D.Sc., C.E., 8 Highburgh terrace, Dowanhill. 1883

185 Edington, George Henry, M.D., M.R.C.S.(Eng.), 14 Buckingham terrace. 1896
*Edwards, John, Govanhaugh Dye-works, M'Neil street. 1883
Elgar, Francis, LL.D., F.R.S., 113 Cannon street, London, E.C. 1884
Elliot, G. F. Scott, M.A., B.Sc., F.L.S., F.R.G.S., Cedarhall, Kilmalcolm. 1896
Erskine, Jas., M.A., M.B., L.F.P.S.G., 351 Bath street. 1886
190*Ewing, Wm., 45 Renfield street. 1883

Fairweather, Wallace, C.E., 62 St. Vincent street. 1880
Falconer, Patrick, 19 Kelvinside gardens. 1876
Falconer, Thos., 50 Kelvingrove st. 1880
Farquhar, John, 13 Belhaven ter. 1872
195 Farquhar, Wm. R., Marymar, Kilmalcolm. 1892
Fawsitt, Charles A., 9 Foremount terrace, Partick. 1879
*Fergus, Freeland, M.D., F.F.P.S.G., *Hon. Secy.*, 22 Blythswood sq. 1887
*Fergus, Oswald, D.D.S., L.D.S., 12 Clairmont gardens. 1896
Ferguson, James, 18 Leven street, Pollokshields. 1897
200*Ferguson, John, M.A., LL.D., F.R.S.E., Professor of Chemistry, University of Glasgow, *Hon. Vice-President.* 1869
Ferguson, John Forbes, 138 West George street. 1895
Fergusson, Alex. A., 48 M'Alpine st. 1847
Findlay, Joseph, Clairmont, Winton drive, Kelvinside. 1873
Finlayson, James, M.D., 2 Woodside place. 1873
205*Fleming, James, 136 Glebe street. 1880
*Fleming, William James, M.D., 3 Woodside terrace. 1876
Fotheringham, T. B., 52 Barrland street, Maxwell road. 1889
Foulis, William, C.E., 45 John st. 1870
*Fowler, John, 5 Derby street, Sandyford. 1880
210 Frame, James, 45 Keir street, Pollokshields. 1885
Fraser, Melville, 31 St. Vincent place. 1890
*French, Thomas, 1 Kelvinside ter. 1897
Frew, Alex., C.E., 175 Hope street. 1876
*Frew, William, Ph.D., Wellpark Brewery. 1898
215*Fullerton, Robt., M.D., 24 Newton place. 1896
Fulton, James, The Glen, Paisley. 1897
Fulton, R. C., 14 Hamilton Park ter. 1890
Fyfe, Alexander, 52 Grant street. 1897
Fyfe, Henry B., 115 St. Vincent st. 1892

220*Gairdner, C. D., C.A., 115 St. Vincent street. 1886
Gairdner, Sir W. T., M.D., LL.D., F.R.S., K.C.B., Professor of Practice of Medicine in the University of Glasgow, 225 St. Vincent st. 1863
Galbraith, Peter, 122 Wellington st. 1889
Galbraith, Walter M., 7 Holyrood crescent. 1893
Gale, James M., C.E., 45 John st. 1856
225 Galloway, T. Lindsay, C.E., 43 Mair street, Plantation. 1881
Gardner, Daniel, 36 Jamaica street. 1869
*Garrow, James R., 6 Pollok road. 1890
*Garroway, John, 694 Duke st. 1875
Gibson, Charles R., St. Mirren's Mills, Paisley. 1895

Gibson, William, 2 Wilton mansions. 1896
Gilfillan, Wm., 129 St. Vincent st. 1881
Gillies, W. D., 17 Royal Exchange square. 1872
Glaister, John, M.D., F.F.P.S.G., D.P.H.(Camb.), F.R.S.E., F.C.S., &c., Professor of Forensic Medicine and Public Health, University of Glasgow. 1879
Goldie, James, 52 St. Enoch square. 1883
Goodwin, Robert, 58 Renfield street. 1875
Gordon, Alexander James, 200-202 George street. 1898
Gow, J. R., 12 Renfield street. 1898
Gow, Leonard, 45 Renfield street. 1889
Gow, Leonard, jun., 45 Renfield st. 1884
Gow, Robert, 3 Victoria circus, Dowanhill gardens. 1860
*Graham, Robert, 108 Eglinton st. 1888
*Graham, William, B.L., 11 Claremont terrace. 1885
Gray, Andrew, 30 Bath street. 1889
Gray, James, M.D., 15 Newton terrace. 1863
Gray, William, 65 Great Clyde street. 1897
Greig, James R., Claremont, Langside. 1897

Halket, George, M.D., F.F.P.S.G., 4 Royal crescent, W. 1889
Hamilton, Don., 313 Crown street. 1894
*Hamilton, John, I.A., 212 St. Vincent street. 1885
Hamilton, Robert O., Victoria Grain Mills, West street, Kingston. 1898
Hanbidge, James E., 8 Balmoral crescent, Crosshill. 1897
Hannay, P. M., Bridge of Allan. 1898
Harley, George, 29 Burnbank gardens. 1891
Harris, David Fraser, M.D., B.Sc. (Lond.), F.R.S.E., F.S.A.(Scot.), Lecturer on Physiology in the University of St. Andrews, 6 Bell street, St. Andrews. 1897
Harvey, William Ure, Ornsay, Glenburn road, Bearsden. 1896
Harvie, William, 8 Bothwell terrace, Hillhead. 1888
Hassard, William John, 209 Sauchiehall street. 1895
Hedderwick, Maxwell, 22 St. Vincent place. 1892
*Henderson, A. P., 20 Newton place. 1880
Henderson, George G., M.A., D.Sc., F.I.C., F.C.S., Professor of Chemistry, Glasgow and West of Scotland Technical College, 204 George street. 1883
*Henderson, John, Meadowside Works, Partick. 1879
Henderson, John, Towerville, Helensburgh. 1890
Henderson, Robert, 167 W. Regent st. 1885
*Henderson, William, 15 Cadogan st. 1873
Hendry, George Scott, 87 Bothwell street. 1895
Henry, R. W., 9 Parkgrove ter., W. 1875
Heys, Zechariah J., South Arthurlie, Barrhead. 1870
Higgins, Henry, jun., 248 West George street. 1878
Hinshelwood, James, M.A., M.D., 9 Elmbank street. 1896
Hodge, William, 27 Montgomerie drive, Kelvinside. 1878
Hogg, Robert, 9 Nithsdale drive, Pollokshields. 1865
Holmes, David T., B.A., Woodburn, Kilmalcolm. 1898
*Hope, James, 8 Dean house, Lenzie. 1898
Houstoun, Wm. Henry, Hillcrest, Cambridge drive. 1895
Howat, William, 37 Elliot street. 1885
Hunt, Edmund, 121 W. George st. 1856
*Hunt, John, Milton of Campsie. 1881
*Hunter, Wm. S., 30 Hope street. 1889
Hutchison, Peter, 3 Lilybank terrace, Hillhead. 1889
Hutton, James, C.A., 203 West George street.

Inglis, John, LL.D., Pointhouse Shipyard. 1895
Inglis, R. A., Culrain, Bothwell. 1889

*Jack, William, M.A., LL.D., Professor of Mathematics in the University of Glasgow. 1881
Jamieson, Andrew, F.R.S.E., M.Inst.C.E., M.Inst.E.E., &c., 16 Rosslyn terrace, Kelvinside. 1881
Jenkins, Thomas Wilson, M.A., M.D., 23 Royal crescent. 1892
Johnston, David, 160 West George st. 1891
Johnston, George, Mosesfield, Springburn. 1896
Johnstone, Jas., Coatbridge street, Port-Dundas. 1869

Kay, Wm. E., F.C.S., 47 Camphill street, Crosshill. 1887
Kean, James, 32 Scotia street, Garnethill. 1888
Kelly, Hugh, M.D., Catrine Bank, Shields road, Pollokshields. 1898
Kelly, James K., M.D., F.F.P.S.G., Park villa, Queen Mary avenue, Crosshill. 1889
Kemp, Wm. (Alexander, Fergusson, & Co., Ltd.), Ruchill, Maryhill. 1898
Kennedy, James, 33 Greendyke st. 1889

295 *Ker, Charles, M.A., C.A., 115 St. Vincent street. 1885
*Ker, Wm., 1 Windsor ter., West. 1874
Kerr, Adam, 175 Trongate. 1887
Kerr, Charles James, 44 West George street. 1877
Kerr, Geo. Munro, 97 Buchanan st. 1890
300 Kerr, John G., M.A., 15 India st. 1878
Key, William, 109 Hope street. 1877
King, Sir James, Bart., LL.D., of Campsie, 115 Wellington street. 1855
King, John, Tigh Ruadh, Possil-park. 1895
King, John C., 21 Newton place. 1898
305 Kirk, Robert, M.D., Newton cottage, Partick. 1877
Kirkpatrick, Alexander B., 88 St. Vincent street. 1885
Kirkpatrick, Andrew J., 179 West George street. 1869
Kirkwood, James, Carling lodge, Ibrox. 1890
Knight, James, M.A., B.Sc., F.C.S., F.G.S., F.E.I.S., The Shieling, Uddingston. 1893
310 *Knox, David J., 19 Renfield street. 1890

Laird, George H., 3 Seton terrace, Dennistoun. 1882
Laird, John, Marchmont, Port-Glasgow. 1876
Laird, John, Royal Exchange Sale Rooms. 1879
Lamb, David, 3 Albion place, Dowanhill. 1896
315 Lamond, Robert, M.A., LL.B., 163 West George street. 1894
Lang, William, F.C.S., Crosspark, Partick. 1865
*Lauder, James, F.R.S.L., Glasgow Athenæum. 1892
Lauder, John, 87 Union street. 1894
Law, John R. K., 20 Ashton gardens, Dowanhill.
320 Leslie, John A., jun., 48 Cadogan st. 1894
*Lindsay, Archd. M., M.A., 87 West Regent street. 1872
Lindsay, John, City Chambers. 1897
Lodge, Richard, M.A., Professor of History, University of Glasgow. 1895
Long, William A. R. Jex, Larch Hill, Moffat. 1898
325 Lothian Alex. V., M.A., 11 Holborn terrace. 1893
Love, James Kerr, M.D., C.M., 10 Newark drive. 1888
Low, Isaac, 71 Stirling road. 1898
Lundholm, C. O., Nobel's Explosives Factory, Ardeer, Stevenston. 1890

M'Ara, Alexander, 65 Morrison st. 1888
330 M'Arly, Thomas, 29 W. George st. 1897
MacArthur, J. G., Rosemary villa, Bowling. 1874
*MacArthur, John S., 45 Renfield street. 1890
M'Callum, Robert, jun., 69 Union street. 1891
*M'Clelland, Andrew Simpson, C.A., 4 Crown gardens, Dowanhill. 1884
335 M'Conville, John, M.D., 27 Newton place. 1870
M'Cowan, David, jun., 6 Eton gardens. 1898
M'Cracken, James, 5 Bowmont terrace, Kelvinside. 1889
M'Crae, John, 7 Kirklee gardens, Kelvinside. 1876
M'Creath, James, M.E., 208 St. Vincent street. 1874
340 M'Culloch, Hugh, 154 West Regent street. 1880
Macdonald, Archibald G., 8 Park circus. 1869
*M'Donald, David, 11 Huntly gardens, Kelvinside. 1897
*Macdonald, John, 72 Great Clyde street. 1896
M'Donald, Joseph, Wellpark Brewery. 1897
345 Macdonald, Thomas, 50 Gibson street, Hillhead. 1869
*Macfarlane, Walter, 12 Lynedoch crescent. 1885
M'Farlane, Wm., Edina lodge, Rutherglen. 1888
*M'Gilvray, R. A., 129 West Regent street. 1880
M'Houl, David, Ph.D., Dalquhurn Works, Renton. 1883
350 *Macindoe, Alex., C.A., 104 West George street. 1894
Mackintosh, Donald J., M.B., C.M., Western Infirmary. 1894
Macintyre, John, M.B., C.M., 179 Bath street. 1895
M'Intyre, Wm., Marion bank, Rutherglen. 1888
M'Kellar, John C., 112 Bath st. 1896
355 M'Kellar, J., 25 Kelvinside terrace. 1893
*M'Kendrick, John G., M.D., C.M., LL.D., F.R.S., F.R.S.E., F.R.C.P.E., Professor of Physiology in the University of Glasgow, 2 Florentine gardens, *Hon. Vice-President.* 1877
*M'Kenzie, W. D., 43 Howard street. 1875
*MacKenzie, W. J., 24 Wilton gards. 1879
Mackinlay, David, 6 Great Western terrace, Hillhead. 1855
360 *Mackinlay, James Murray, 4 Westbourne gardens. 1886

M'Kissack, John, 68 West Regent st. 1881
Maclae, A. Crum, 147 St. Vincent st. 1884
M'Laren, Robert, Royal Bank, Garscube cross. 1898
M'Laurin, Robert, 303 Main street, Maryhill. 1895
365 *Maclay, David T., 169 W. George street. 1879
Maclay, W., Eildon villas, Mount Florida. 1893
M'Lean, Angus, B.Sc., C.E., Technical School, Paisley, *Acting Secy.* 1897
MacLean, A. B., Craigpark Works, Dennistoun. 1899
Maclean, Magnus, M.A., F.R.S.E., D.Sc., Professor of Electrical Engineering, Glasgow and West of Scotland Technical College. 1885
370 *MacLehose, James J., M.A., 61 St. Vincent street. 1882
*Macleod, A., 3 Dundas street. 1893
M'Millan, A. Lewis, M.D., C.M., 1 Rosebery ter., Gt. Western rd. 1897
Macnair, D. S., Ph.D., B.Sc., 10 Maxwell drive. 1895
Macouat, R. B., 37 Elliot street. 1885
375 Macphail, Donald, M.D., Garturk cottage, Whifflet, Coatbridge. 1877
M'Pherson, George L., 30 Albert road, Crosshill, East. 1872
M'Vail, D. C., M.B., Professor of Clinical Medicine, St. Mungo's College, 3 St. James' terrace, Hillhead. 1873
Macwhannell, Ninian, 58 West Regent street. 1898
Machell Thomas, 1 Burnbank ter. 1886
380 Main, Robert B., 56 Dalziel drive. 1885
Malloch, A. M., Firhill, Garscube road. 1896
Mann, John, C.A., 137 West George street, *Treasurer.* 1856
Mann, John, jun., M.A., C.A., 137 West George street. 1885
Mann, Ludovic MacLellan, 137 West George street. 1897
385 Manwell, James, The Hut, 4 Albert drive, Pollokshields. 1876
Marr, Hamilton Clelland, M.D., Woodilee Asylum, Lenzie. 1899
Marshall, T. Rhymer, D.Sc., Professor of Chemistry in St. Mungo's College, 19 Sandyford place. 1894
Martin, Jas. F., 63 Brunswick st. 1895
Martin, Robert, 8 Burnbank terrace, W. 1897
390 Marwick, Sir J. D., LL.D., F.R.S.E., 19 Woodside terrace. 1878
Mathie, George M., 15 Wardlawhill terrace, Rutherglen. 1895
Mathieson, J. H., 3 Grosvenor ter., Kelvinside. 1896
Mathieson, T. O., 3 Grosvenor ter. 1896
Mavor, Henry A., 47 King street, Mile-end. 1887
395 Mavor, Samuel, 37 Burnbank gard. 1890
May, A. H., 1 Crown circus, Dowanhill. 1898
Mayer, John, Strathview, Cathkin road, Langside. 1860
Mechan, Arthur, 60 Elliot street. 1876
Mechan, Henry, 60 Elliot street. 1879
400 Menzies, Thos., Hutchesons' Grammar School, Crown street. 1859
Menzies, William Crawford, City Improvement Trust, 34 Trongate. 1895
Millar, James, 158 Parliamentary road. 1870
Miller, A. Lindsay, 122 Wellington street. 1878
*Miller, Arch. Russell, Castlebank, Bothwell. 1884
405 Miller, Major David S., 8 Royal crescent, W. 1887
*Miller, George, Winton drive, Kelvinside. 1881
Miller, G. J., Frankfield, Shettleston. 1888
*Miller, Thos. P., Cambuslang Dyeworks. 1864
Mills, Edmund J., D.Sc., F.R.S., "Young" Professor of Technical Chemistry, Glasgow and West of Scotland Technical College, 60 John street. 1875
410 Mirrlees, James B., Redlands, Kelvinside. 1866
*Mirrlees, William J., 45 Scotland st. 1889
Mitchell, Andrew, C.A., The Glasgow District Subway Co., Factor and Treasurer's Office, St. Enoch Square Station. 1896
*Mitchell, George A., 5 West Regent street. 1883
Mitchell, Nelson, 3 Great Western terrace. 1898
415 Mitchell, Wm. James, M.A., B.L., 49 West George street. 1897
Mitchell, J. O., LL.D, 7 Huntly gardens. 1899
*Moffatt, Alexander, 23 Abercromby place, Edinburgh. 1874
Mollison, James, 6 Hillside gardens, Partick. 1889
*Mond, Robert Ludwig, B.A. (Cantab.), F.R.S.E., 20 Avenue road, Regent's park, London, N.W. 1890
420 *Monro, T. K., M.A., M.D., F.F.P.S.G., 10 Clairmont gards. 1897
*Monteith, Robert, Greenbank, Dowanhill gardens. 1885
Moore, Alexander, C.A., 50 Montgomerie drive, Kelvinside. 1869

Moore, Alexander George, M.A., B.Sc., 13 Clairmont gardens. 1886
Morrice, Jas. A., 1 Prince's ter., Dowanhill. 1883
425 Motion, James Russell, 38 Cochrane street. 1887
Motion, Thomas Mason, Port-Dundas. 1897
Muir, Alex., 400 Eglinton street. 1883
*Muir, Allan, Ardmay, Newlands road, Langside. 1881
Muir, Sir John, Bart., 22 West Nile street. 1876
430*Muirhead, Andrew Erskine, Cart Forge, Crossmyloof. 1873
Muirhead, James, 2 Bowmont gardens, Kelvinside. 1887
*Muirhead, Robert F., M.A., B.Sc., 24 Kersland street, Hillhead. 1879
Munro, Daniel, F.S.I., 10 Doune terrace, Kelvinside. 1867
Munro, J. M. M., M.Inst.E.E., M.Inst.C.E., F.R.S.E., 136 Bothwell street. 1896
435 Munsie, George, 1 St. John's ter., Hillhead. 1871
Munsie, Robert George, 10 Berkeley terrace, West. 1883
Murdoch, George, 40 St. Vincent pl. 1894
*Murdoch, Robert, 91 Maxwell road. 1880
*Murray, Daniel, 4 Eastpark terrace, Maryhill. 1896
440*Murray, David, LL.D., 169 West George street. 1876
Murray, John Bruce, 24 George square, 1890

Napier, Alex., M.D. F.F.P.S.G., Rose Bank, Queen Mary avenue, Crosshill. 1886
*Napier, John, Audley mansions, Grosvenor square, London. 1849
*Neilson, George, 34 Granby ter. 1897
445*Neilson, James, 116 Bishop street, Port-Dundas. 1896
Nelson, Alex., 80 Gordon street. 1880
*Newlands, Joseph F., 28 Renfield street. 1883
Nicoll, James H., M.B., 4 Woodside place. 1897
Nish, Robert, 9 Claremont terrace. 1897

450 Orr, Robert, 79 West Nile street. 1890
Osborne, Alex., 4 Kew terrace. 1870
Osborne, Robert, 4 Huntly gardens. 1890

Park, James, 51 Millburn street. 1877
Park, Robert, M.D., 40 Grant st. 1894
455 Parker, Edward H., 11 Strathmore gardens, Hillhead. 1897
*Parker, John Dunlop, C.E., 146 West Regent street. 1889
*Parnie, William, 27 Union street. 1897
*Paterson, Robert, C.A., 28 Renfield street. 1881
Paton, James, F.L.S., Corporation Galleries, and Kelvingrove Museum. 1876
460 Patrick, Joseph, M.A., C.A., 203 West George street. 1893
Patterson, T. L., F.C.S., Maybank, Finnart street, Greenock. 1873
Peacock, T. Reid, 122 Wellington street. 1898
Petrie, Alexander, I.A., 134 Wellington street. 1885
Pirie, John, M.D., 26 Elmbank crescent. 1877
465*Pirrie, Robert, 9 Buckingham ter. 1875
Pollock, A. Barr, 3 Belgrave terrace, Hillhead. 1897
*Pollock, R., M.B., C.M., F.F.P.S.G., Laurieston house, Pollokshields. 1883
*Provan, James, 40 West Nile st. 1868
*Provand, A. D., M.P., 2 Whitehall court, London, S.W. 1888

470 Raalte, Jacques Van, Baltic Chambers, 50 Wellington street. 1884
Ramsey, Robert, 14 Park terrace. 1889
*Ramsey, Robert, jun., 14 Park terrace. 1898
Rankine, David, C.E., 238 West George street. 1875
Rattray, Rev. Alex., M.A., Parkhead Parish, 4 Westercraigs, Dennistoun. 1879
475 Rattray, William A., 233 Hope st. 1890
Reid, David, 16 Cambridge street. 1887
*Reid, Hugh, Belmont, Springburn. 1880
Reid, James, 15 Montgomerie cres. 1886
Reid, Thos., M.D., LL.D., 11 Elmbank street. 1869
480 Reid, William, M.A., 61 Grant st. 1881
*Reid, William L., M.D., 7 Royal crescent, West. 1882
Reith, Rev. George, M.A., D.D., Free College Church, 37 Lynedoch street. 1876
Renton, James Crawford, M.D., L.R.C.P. & S.Ed., 1 Woodside terrace. 1875
Rey, Hector, B.L., B.Sc., 2 Ailsa terrace. 1889
485 Richmond, Thos., L.R.C.P.E., 22 Holyrood crescent. 1887
Robb, John, Busby house, Busby. 1897
Robertson, John, Woodside school, Endcliffe, Langside, *Librarian.* 1860
Robertson, J. M'Gregor, M.A., M.B., C.M., 26 Buckingham ter., Hillhead. 1881
Robertson, Mure, M.E., 4 Clairmont gardens. 1897

Robertson, Robert A., 8 Park Circus place. 1877
Robertson, Robert H., Clyde bank, Rutherglen. 1888
Robertson, William, C.E., 123 St. Vincent street. 1869
*Rogers, John C., 224 St. Vincent street. 1888
Rose, Alexander, Richmond house, Dowanhill. 1879
*Ross, David, M.A., B.Sc., LL.D., E.C. Training College. 1888
Ross, Henry, 7 Park quadrant. 1876
*Ross, John, 9 Westbourne gardens. 1885
Ross, John Munn, C.A., 115 Wellington street. 1894
Ross, William, 10 Regent place, Shawlands. 1893
*Rottenburg, Paul, 105 West George street, *Vice-President.* 1872
Rowan, James, 22 Woodside place. 1897
Rowan, W. G., 234 W. George street. 1881
Rundell, R. Cooper, Underwriters' Room, Royal Exchange. 1877

Salmon, W. Forrest, F.R.I.B.A., 53 Bothwell street. 1870
Sawers, William D., Assoc.I.C., Springbank house, Kirkintilloch. 1894
Sayers, William Brooks, M.I.E.E., 189 St. Vincent street. 1890
Schmidt, Alfred, 508 New City rd. 1881
Scott, Alex., 34 Lawrence street, Dowanhill. 1871
*Scott, D. M'Laren, 2 Park quad. 1881
Scott, John, 245 Sauchiehall st. 1892
Scott, Robt., I.M., 115 Wellington street. 1884
Seligmann, Hermann L., 59 St. Vincent street. 1850
Sexton, A. Humboldt, F.C.S., F.I.C., F.R.S.E., Professor of Metallurgy, Glasgow and West of Scotland Technical College, 204 George street. 1892
Shannan, A. M'Farlane, 7 Scott street, Garnethill. 1896
Simons, Michael, 206 Bath street. 1880
Simpson, J. C., M.D., 9 Marlborough terrace, Kelvinside. 1896
Sinclair, Alexander, Ajmere lodge, Langside. 1883
Sinclair, John, 150 Buchanan st. 1898
Sloane, F. N., C.A., 187 West George street. 1893
Smart, William, M.A., LL.D., Professor of Political Economy, University of Glasgow, Nunholm, Dowanhill, *Vice-President.* 1886
Smellie, George, I.M., 167 St. Vincent street. 1880
*Smellie, Thos. D., F.S.I. 209 St. Vincent street. 1871
Smith, D. Johnstone, C.A., 149 W. George street. 1888
Smith, Hugh C., 55 Bath street. 1861
*Smith, J. Guthrie, 54 W. Nile st. 1875
*Smith, Robert B., Bonnybridge, Stirlingshire. 1884
*Smith, W. B., 31 Queen street. 1895
Snodgrass, William, M.A., M.B., C.M., 11 Victoria cres., Dowanhill. 1890
*Somerville, Alexander, B.Sc., F.L.S., 4 Bute mansions, Hillhead street, Hillhead. 1888
Sorley, Robert, 3 Buchanan st. 1878
*Spencer, Charles L., Edgehill, Kelvinside. 1891
*Spencer, J. J., Edgehill, Kelvinside. 1895
Spens, John A., 169 W. George st. 1879
Stanford, Edward C. C., F.C.S., Glenwood, Dalmuir, Dumbartonshire. 1864
*Steel, William Strang, Philiphaugh, Selkirk. 1889
*Stephen, John, Domira, Partick. 1880
Steuart, Daniel Rankin, Osborne cottage, Broxburn, West Lothian. 1877
Steven, Alexander Kay, Westmount, Kelvinside. 1897
*Steven, Hugh, Westmount, Montgomerie drive. 1869
Steven, John, 32 Elliot street. 1875
Steven, J. H., Westmount, Kelvinside. 1897
*Stevenson, D. M., 12 Waterloo st. 1889
*Stevenson, Jas., F.R.G.S., 23 West Nile street. 1870
Stevenson, John, 12 Victoria road, Lenzie. 1892
Stevenson, Robert, M.D., Labrador, Innellan. 1898
Stevenson, Wm., 21 Clyde place. 1888
Stewart, Andrew, 41 Oswald street. 1887
Stewart, Archibald, Marnock villa, Queen's drive, Crosshill. 1892
Stewart, David, 3 Clifton place. 1856
Stewart, John, 220 Parliamentary road. 1896
*Stobo, Thomas, Somerset house, Garelochhead. 1884
Stockman, Ralph, M.D., F.R.S.E., Professor of Materia Medica, The University of Glasgow. 1897
Stoddart, James Edward Howden, Mid-Calder, N.B. 1872
Strachan, R. U., Sheriff-Substitute, 9 Crown terrace. 1896
*Strain, John, C.E., 154 W. George street. 1876

Strathie, David C.A., 162 St. Vincent street. 1895
*Sutherland, David, Royal Marine Hotel, Nairn. 1880
*Sutherland, John, Great Western Hotel, Oban. 1880
Sutherland, J. R., C.E., 45 John street. 1884
560 Swan, Charles C., 15 Rose street, Garnethill. 1891
Syminton, Thomas, Solicitor, 94 Hope street. 1896

Tatlock, John, F.I.C., 13 Parkgrove terrace, West, Sandyford. 1875
Tatlock, Robt. R., F.R.S.E., F.I.C., F.C.S., 156 Bath street. 1868
Taylor, Benjamin, F.R.G.S., 10 Derby crescent, Kelvinside. 1872
565 *Teacher, John H., M.B., C.M., 32 Huntly gardens. 1898
Teague, Francis, M.I.E.E., Electric Lighting Station, Paisley. 1894
Tennant, Sir Charles, Bart., 195 West George street. 1868
Tennent, Gavin P., M.D., 159 Bath street. 1875
Thom, R. Wilson, 8 Woodside ter. 1898
570 Thomas, Moses, M.D., Superintendent, Royal Infirmary. 1890
Thomson, David, I.A., F.R.I.B.A., 2 West Regent street. 1869
Thomson, George C., F.C.S., 4 The Green, Bromborough Pool, near Birkenhead. 1883
Thomson, Gilbert, M.A., C.E., 53 Bothwell street. 1885
Thompson, G. R., 204 George street. 1895
575 *Thomson, James, F.R.I.B.A., 88 Bath street. 1886
*Thomson, James M., Glen Tower, Kelvinside. 1892
Todd, John Aiton, B.L., 115 St. Vincent street. 1897
Townsend, C. W., Crawford street, Port-Dundas. 1890
Trotter, John, 28 Gordon street. 1899
580 *Tullis, David, St. Ann's Leather Works, Bridgeton. 1894
*Tullis, James Thomson, Anchorage, Burnside, Rutherglen. 1883
*Turnbull, John, jun., M.I.M.E., 18 Blythswood square. 1883
Turnbull, Robert, 122 Wellington street. 1895
Turner, George A., M.D., 1 Clifton place, Sauchiehall street. 1883
585 Turner, William, Barnfrow, Helensburgh. 1875
Turpie, John, 339 Sauchiehall street. 1896

Ure, William P., Regent Mills, Sandyford. 1893

Walker, Adam, 26 Newton place. 1880
*Walker, Archibald, M.A. (Oxon.), F.I.C., F.C.S., 8 Crown terrace, Dowanhill. 1858
590 Walker, James A., 300 St. Vincent street. 1898
Walker, J. W. O., 63 Montgomerie street, Kelvinside. 1896
*Wallace, Hugh, Bank of Scotland, 544 St. Vincent street. 1879
Wallace, R. Hedger, 3 St. Clair terrace, Morningside drive, Edinburgh. 1897
*Wallace, Wm., M.A., M.B., C.M., 25 Newton place. 1888
595 Warren, John A., C.E., 115 Wellington street. 1887
Watkinson, Wm. H., Whit. Sch., M.Inst.Mech.E., Professor of Steam and Steam Engines in the Glasgow and West of Scotland Technical College, The Pines, Crookston. 1893
Watson, Archibald, 5 Westbourne terrace. 1881
Watson, James, 6 Kirklee road, Kelvinside, W. 1873
*Watson, John, 205 West George street. 1886
600 Watson, Joseph, 225 West George street. 1882
*Watson, J. Robertson, M.A., Professor of Chemistry, Anderson's College Medical School, Dumbarton road. 1891
*Watson, Thomas Lennox, I.A., F.R.I.B.A., 166 Bath street. 1876
*Watson, Sir William Renny, 16 Woodlands terrace. 1870
Watson, William, Gartmore, Langside. 1897
605 Welsh, John M., Ph.D., F.E.I.S., F.R.G.S., 115 Ledard road, Langside. 1897
Welsh, Thomas M., 3 Prince's gardens, Dowanhill. 1883
Wenley, James A., 5 Drumsheugh gardens, Edinburgh. 1870
Westlands, Robert, 4 Dixon street. 1869
Whyte, A. C., L.D.S., 42 Dundas street. 1892
610 White, John, Scotstoun Mills, Partick. 1897
*Whitelaw, Thomas N., 87 Sydney street. 1892
Whitelaw, William, Hope cottage, Crookston. 1897
*Whitson, Jas., M.D., F.F.P.S.G., 13 Somerset place. 1882

Widmer, Justus, 21 Athole gardens. 1887
615 Wield, John, 9 Barns street, Ayr. 1895
Williamson, John, 65 West Regent street. 1881
Wilson, Alex., Hydepark Foundry, 54 Finnieston street. 1874
*Wilson, David, M.A., D.Sc., F.C.S., Carbeth, Killearn. 1898
Wilson, James Scott, 154 West George street. 1898
620 Wilson, William, Virginia buildings. 1881
Wilson, Wm., Schoolhouse, Pavenham, Bedford. 1889
Wingate, Arthur, 10 Prince's gardens, Dowanhill. 1882
*Wingate, John B., 7 Crown terrace, Dowanhill. 1881
Wingate, Walter E., 4 Bowmont ter. 1880
625 Wood, James, M.A., Glasgow Academy. 1885
*Wood, Wm. Jas., 38 Cochrane st. 1893
*Workman, Chas., M.D., F.F.P. & S.G., 5 Woodside terrace. 1898
Wright, Robert Patrick, Professor of Agriculture, Glasgow and West of Scotland Technical College, 60 John street. 1895

Yellowlees, D., M.D., LL.D., Physician-Superintendent, Gartnavel. 1881
630 Young, John, 2 Montague terrace, Kelvinside. 1885
Young, John, 88 Renfield street. 1881
*Young, John, jun., M.A., B.Sc., Royston, Bridge of Weir. 1887
*Young, Thos. Graham, Westfield, West Calder. 1880
Younger, George, 166 Ingram street. 1847

New Members—*continued*—
Hannay, P. M., 325.
Hope, James, 316.
Kelly, Hugh, M.D., 316.
Kemp, William, 325.
King, John C., 316.
Long, William A. R. Jex, 326.
Low, Isaac, 316.
M'Cowan, David, jun., 328.
M'Laren, Robert, 327.
M'Lean, A. B., 331.
Macwhannell, Ninian, 325.
Marr, H. C., M.D., 329.
May, A. H., 325.
Mitchell, J. O., LL.D., 329.
Mitchell, Nelson, 316.
Montgomerie-Fleming, J. B., 329.
Peacock, T. Reid, 325.
Ramsay, Robert, jun., 327.
Sinclair, John, 316.
Stevenson, Robert, M.D., 316.
Teacher. John H., M.B., 316.
Thom, R. Wilson. 316.
Trotter, John, 333.
Whyte, W. N., 325.
Wilson, David, M.A., D.Sc., 315.
Wilson, James S., 325.
Workman, Charles. M.D., 328.
Minutes of Session, 1898-99, 315-335.
Motion, J. R., elected member of Council, 319.

Neva, Russian produce carried on the, 197.

Office-bearers of Sections, 337-338.
Office-bearers of Society, 336.
Opium trade in China, 182.
Origin of life, W. Wallace on reasons for rejecting physico-chemical theories of the origin of, 256-266.

Palæolithic remains in Scotland, Rev. F. Smith on, 30-38.
Paterson, Wm., on fires, their causes and prevention, 17-29.
Paton, Jas., F.L.S., elected member of Council, 319.
Pauperism in Scotland, 6.
Periodicals taken by the Society, 353-355.
Philological Section, election of office-bearers, 325.
Poor, John Mann, jun., on better houses for the, 83-124.
Prospect in Chinese trade, G. F. Scott Elliot on the, 174-192.
Prussia, education in, 231.

Remains, palæolithic, in Scotland, Rev. F. Smith on, 30-38.
Report of Council (1897-98), 316, 317.
Report of Library Committee (1897-98), 318.
Report of visit of Society to Dumbuck crannog, 267-271.
Report on Graham Lecture and Medal Fund, by John Mann, C.A., 308-311.
Robertson, John, re-elected Honorary Librarian, 319.
Rontgen rays, A. A. Campbell Swinton on the, 272-283.
Rottenburg, Paul, elected Vice-President, 319.
Russell, James B., LL.D., M.D., elected an honorary member, 327.
Russia, a voyage across, S. Mavor on, 192-222.
Russian peasantry, ignorance of the, 213.

Sanitary and Social Economy Section, election of office-bearers, 324.
Science Lecture Fund, abstract of Treasurer's account, 323.
Scotland, palæolithic remains in, Rev. F. Smith on, 30-38.
Scotland, social progress of, in recent times, Dr. Ebenezer Duncan on, 1-11.
Scottish vernacular, Dr. J. Colville on the, 39-58.
Sexton, Professor A. H., F.C.S., F.I.C., on the evolution of the blast furnace, 284-293.
Siberia, embarkation of convicts for, 214.
Silk, export of, from China, 181.
Smallpox hospital experience of the protective influence of vaccination, Dr. R. S. Thomson on, 294-306.
Smith, Rev. Frederick, on investigations into palæolithic remains in Scotland, 30-38.
Smith, Sheriff W. C., on imperial grants considered as adjustments of taxation, 59-74.
Social progress of Scotland in recent times, Dr. Ebenezer Duncan on, 1-11.
Somme Valley, comparison between fabricated stones found in Scotland and those found in the, 33.
Swinton, A. A. Campbell, on electric discharges in vacuo and the Rontgen rays, 272-283.
Suicide in Scotland, 9.

Tartars, acquisitive propensities of, 217.
Taxation, imperial grants considered as adjustments of, Sheriff W. C. Smith on, 59-74.
Taxation of land values, John A. Todd on the, 140, 155.
Tea, export of, from China, 181.
Thomson, Gilbert, C.E., M.A., elected member of Council, 319.

Thomson, R. S., M.D., B.Sc., on a smallpox hospital experience of the protective influence of vaccination, 294-306.
Tindal, J. A. Love, on the Workmen's Compensation Act (1897) as bearing on the building trade, 156-173.
Todd, John A., B.L., on the taxation of land values, 140-155.
Trade, prospect in Chinese, G. F. Scott Elliot on, 164-192.
Treasurer's account (1897-98) abstract of, 320-321; Graham Medal and Lecture Fund (1897-98), abstract of, 322; Science Lecture Association Fund (1897-98), 323.
Vaccination, efficient and inefficient, 296.
Vaccination, Dr. R. S. Thomson on the protective influence of, 294-306.
Vernacular, the Scottish, Dr. J. Colville on, 39-58.
Volga, difficulty of navigation on the, 218.

Wallace, William, M.B., C.M., M.A., on reasons for rejecting physico-chemical theories of the origin of life, 256-266.
Wehnelt's contact breaker, 282.

X-rays, Dr. W. J. Fleming on a method of localising with, 12-15.

Stanford University Libraries
3 6105 124 460 598